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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for the network signalling

Signalling System No. 7 B-ISDN User Part (B-ISUP) – Basic call procedures

ITU-T Recommendation Q.2764

(Formerly CCITT Recommendation)

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ITU-T Recommendation Q.2764

Signalling System No. 7 B-ISDN User Part (B-ISUP) – Basic call procedures

Summary

This ITU-T Recommendation is one of a set of Recommendations that describe the Broadband ISDN User Part for Broadband Signalling Capability Set 1 and beyond.

This ITU-T Recommendation describes the procedures relating to:

- Basic call setup and clear down;
- Maintenance facilities.

Source

ITU-T Recommendation Q.2764 was revised by ITU-T Study Group 11 (1997-2000) and approved under the WTSC Resolution 1 procedure on 3 December 1999.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. 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 turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSC Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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Signalling System No.7 B-ISDN User Part (B-ISUP) – Basic call procedures

1 General

1.1 Scope

This ITU-T Recommendation describes the basic B-ISDN User Part signalling procedures for the setup and cleardown of national and international B-ISDN Capability Set 1 network connections, and beyond.

The actions to be taken at six exchange types are described:

- originating exchange;
- intermediate national exchange;
- outgoing international exchange;
- intermediate international exchange;
- destination exchange;
- incoming international exchange.

Actions common for all exchange types are described only once. Different, or additional, actions required in specific exchange types are described in separate subclauses applicable to this type of exchange.

The procedures specified in this ITU-T Recommendation relate to B-ISDN Signalling Capability Set 1, and beyond, basic call, i.e. calls not involving B-ISDN supplementary services.

1.2 References

See ITU-T Recommendation Q.2761.

1.3 Terms and definitions

See ITU-T Recommendation Q.2761.

1.4 Abbreviations

This ITU-T Recommendation uses the following abbreviations:

ABR Available Bit Rate

AE Application Entity

AEI Application Entity Instance

AP Application Process

ASE Application Service Element

ATC ATM Transfer Capability

ATM Asynchronous Transfer Mode

ABT-DT ATM Block Transfer with Delayed Transmission

ABT-IT	ATM Block Transfer with Immediate Transmission
BCC	Bearer Connection Control
B-ISDN	Broadband Integrated Services Digital Network
B-ISUP	B-ISDN User Part
CAC	Call Admission Control
CC	Call Control
CDVT	Cell Delay Variation Tolerance
CEI	Connection Element Identifier
FRT	Fixed Round-trip Time
ICR	Initial Cell Rate
MBS	Maximum Burst Size
MC	Maintenance Control
MCR	Minimum Cell Rate
MTP	Message Transfer Part
MTP-2	MTP Level 2
MTP-3	MTP Level 3
M/O	Mandatory/Optional
NI	Network Interface
N-ISDN	Narrow-band Integrated Services Digital Network
PCR	Peak Cell Rate
RDF	Rate Decrement Factor
RIF	Rate Increment Factor
RM	Resource Management
SACF	Single Association Control Function
SAO	Single Association Object
SBR	Statistical Bit Rate
SCR	Sustainable Cell Rate
SDL	Specification and Description Language
SID	Signalling Identifier
TAR	Temporary Alternative Routing
TBE	Transient Buffer Exposure
UI	Unrecognized Information
VCI	Virtual Channel Identifier
VPC	Virtual Path Connection
VPCI	Virtual Path Connection Identifier

1.5 Recommendation structure

The description of the B-ISDN User Part procedures in this ITU-T Recommendation are structured according to the model described in Annex A.

The description is thus divided into two main parts:

- Protocol functions.
- Non-protocol functions, i.e. exchange nodal functions; this is referred to as the "Application Process". (This ITU-T Recommendation describes only the part of the total Application Process in the exchange that relates to B-ISUP, i.e. the part indicated in Annex A as the "B-ISUP Nodal functions".)

The protocol functions are subdivided into five parts: Bearer Connection Control (BCC) ASE[1], Maintenance Control (MC) ASE, Call Control (CC) ASE Unrecognized Information (UI) ASE and SACF. These procedures are described in both text and SDLs. The Application Process contains Call Control, Maintenance and Compatibility functions.

This separation of the procedural description provides a logical and convenient document structure, but does not imply that the protocol itself is separated: e.g. the Initial Address message always signifies the simultaneous set-up of a bearer and an associated call.

The service primitive technique, used to define the B-ISUP ASEs and the SACF specific to Signalling Capability Set 1 and beyond, is a way of describing how the services offered by an ASE, or SACF, – the provider of (a set) of service(s) – can be accessed by the user of the service(s) – the SACF or the Application Process (AP), respectively.

The service primitive interface is a conceptual interface and is not a testable or an accessible interface. It is a descriptive tool. The use of service primitives at an interface does not imply any particular implementation of that interface, nor does it imply that an implementation must conform to that particular service primitive interface to provide the stated service.

All conformance to the B-ISUP specifications is based on the external behaviour at a node, i.e. on the generation of the correct message structure (as specified in ITU-T Recommendation Q.2763) and in the proper sequence (as specified in this ITU-T Recommendation.)

The structure, and examples of its usage, is illustrated diagramatically in Annex A.

Figures included in Annex B show examples for call setup sequences.

Annex C provides an introduction to the modelling of the protocol using Specification and Description Language (SDL).

2 Call Control, application process functions

2.1 Introduction

2.1.1 Primitive interface

The Call Control functions in the Application Process use the services provided by the SACF primitive interface. These are listed in Table 2-1.

The primitives on this interface, in many cases, correspond with B-ISUP messages, this is also indicated in Table 2-1.

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[1] This ITU-T Recommendation uses OSI ALS specification techniques described in ITU-T Recommendation Q.1400, which describes the application of concepts such as Application Service Elements (ASEs) and Single Association Control Function (SACF). Familiarity with that ITU-T Recommendation is recommended.

Table 2-1/Q.2764 – Call Control primitives between AP and SACF

Primitive name	Types	Corresponding B-ISUP message(s)
Set_Up	Request/Indication	Initial Address
Address_Complete	Request/Indication	Address Complete
Incoming_Resources_Accepted	Request/Indication	IAM Acknowledge
Incoming_Resources_Rejected	Request/Indication	IAM Reject
Subsequent_Address	Request/Indication	Subsequent Address
Release	Request/Indication/Response/ Confirmation	Release, Release Complete
Pre-release Information	Request/Indication	Pre-Release_Information
Answer	Request/Indication	Answer
Progress	Request/Indication	Call Progress
Suspend	Request/Indication	Suspend
Resume	Request/Indication	Resume
Forward_Transfer	Request/Indication	Forward Transfer
Network_Resource_Management	Request/Indication	Network Resource Management
Segment (National use)	Request/Indication	Segmentation
Error	Indication	–
Modify	Request/Indication/ Response/Confirmation	Modify Request, Modify Acknowledge
Modify_Rejected	Request/Indication	Modify Reject
Connection_Available	Request/Indication	Connection Available

Tables 2-2 to 2-18 (see 2.8) list the mandatory and optional contents for these primitives for the setup and release of basic call/connections.

2.1.2 Assignment procedure of VPCI/VCI and bandwidth

Two options are provided for the assignment procedures of VPCI, VCI and traffic related resources.

Option 1

The one side selection of bandwidth and VPCI/VCI values, which allows one exchange to be the assigning exchange for both outgoing and incoming call/connections, on a VPCI basis, is adopted to prevent dual seizure completely.

Option 2

The one side selection of VCI values, which allows one exchange to be the assigning exchange for both outgoing and incoming call/connections, on a VPCI basis, is adopted to prevent dual seizure of VCIs.

It is possible that the two exchanges will attempt to seize the same VPC at approximately the same time. In order to reduce the probability of VPC glare cases, the adjacent exchanges shall perform the selection of the VPC in opposite order.

NOTE – A VPC glare will not automatically lead to the rejection of one or both of the involved connections. A connection has to be rejected only, when in addition to the VPC glare a "Lack of Resources" condition is encountered, e.g. bandwidth not available.

2.1.2.1 Management of VPCI/VCI value and bandwidth of each VPC

Option 1

Before a route between two exchanges can be put into service, the following is necessary:

- the VPCIs to be used must be assigned unambiguously and identically at both ends of each VPC;
- for every VPCI it must be defined which exchange controls this VPCI, i.e. which is responsible for assigning bandwidth and VPCI/VCI for this VPCI.

The following default mechanism is defined for determining this designation:

- Each exchange will be the assigning exchange for one half of the VPCI values. The exchange with the higher signalling point code will be the assigning exchange for all even numbered VPCI values, and the other exchange will be the assigning exchange for all odd numbered VPCI values.
- For national applications other methods for determining the assigning exchange may be applied.

Option 2

Before a route between two exchanges can be put into service, the following is necessary:

- the VPCIs to be used must be assigned unambiguously and identically at both ends of each VPC;
- for every VPCI it must be defined which exchange controls this VPCI, i.e. which is responsible for assigning the VCI for this VPCI;
- for every exchange the order of VPCI selection must be defined.

The following default mechanism is defined for determining this designation:

- Each exchange will be the assigning exchange for one half of the VPCI values. The exchange with the higher signalling point code will be the assigning exchange for all even numbered VPCI values, and the other exchange will be the assigning exchange for all odd numbered VPCI values.
- Each assigning exchange shall perform the selection of a suitable VPCI in ascending order, whereas the non-assigning exchange performs the selection in descending order.

For national applications other methods for determining the assigning exchange may be applied.

2.1.2.2 Assignment of VPCI/VCI and bandwidth

Option 1

If an exchange has to set up a call/connection (also in the case of an automatic repeat attempt), it shall first use a VPCI which it is controlling, i.e. a Set_Up request including the Connection Element Identifier parameter is issued. Only if there is no available bandwidth or VCIs related to the VPCIs that can support the requested traffic capabilities and which the exchange is controlling, the exchange issues a Set_Up request without the Connection Element Identifier parameter.

If an exchange is requested to set up a call/connection for which alternative, or minimum, cell rates are requested, or for which ABT is indicated in the Broadband Bearer Capability parameter, the exchange shall:

- If available, use a VPCI for which it is the assigning exchange and set up the call using the original requested connection characteristics (PCR, SCR, MBS, RM PCR), i.e. a Set_Up request primitive including the connection element identifier parameter is issued. If present in the SETUP message, the alternative ATM cell rate is checked to see if this can be

supported by the allocated resources. If the alternative ATM cell rate cannot be supported, then it is discarded.

- If the original requested connection characteristics cannot be supported using a VPCI for which it is the assigning exchange, do one of the following (depending upon routing results):
  - i) act as the non-assigning exchange, i.e. issue a Set_Up request primitive without the connection element identifier parameter, using the originally requested connection characteristics; or
  - ii) issue a Set_Up request primitive using a VPCI for which it is the assigning exchange, requesting (as applicable):
    - – either a cell rate between the original requested cell rate and the minimum ATM cell rate; or
    - – the alternative ATM cell rate; or
  - iii) if neither i) nor ii) is possible, i.e. no VPCI is available that can support the connection characteristics originally requested, or the minimum ATM cell rate or alternative ATM cell rate requested by the user, then the connection shall be released.

If an exchange is requested to set up a call/connection for which ABR is indicated in the BroadBand Bearer Capability Parameter, the assigning exchange shall:

- If available, use a VPCI for which it is the assigning exchange and set up the call/connection using the original requested MCR, i.e. a Set_Up request primitive including the connection element identifier parameter is issued. If the requested PCR, ICR, TBE, RIF or RDF cannot be supported, the exchange shall adjust these values according to the rules given in Table 2-20.
- If the original requested MCR cannot be supported using a VPCI for which it is the assigning exchange, do one of the following (depending on routing results):
  - i) act as the non-assigning exchange, i.e. issue a Set_Up request primitive without the connection element identifier parameter, using the original requested connection characteristics; or
  - ii) issue a Set_Up request primitive using a VPCI for which it is the assigning exchange, support a cell rate between the originally requested cell rate and the cell rate indicated in the minimum ATM cell rate parameter. If the requested PCR, ICR, TBE, RIF or RDF cannot be supported, the exchange shall adjust these values according to the rules given in Table 2-20.

The assigning exchange assigns both VPCI/VCI and bandwidth for outgoing and incoming call/connections. The non-assigning exchange does not assign but asks the assigning exchange to assign both VPCI/VCI and bandwidth.

a) Outgoing call/connections from the assigning exchange to the non-assigning exchange.

The assigning exchange performs the following actions:

- Selection of one VPC from several available VPCs which can provide the requested bandwidth according to the requested connection characteristics (PCR, SCR, MBS, MCR, etc.) and other requested traffic capabilities such as Quality of Service as per the rules described above.
- Assigning bandwidth and a VCI value to the call/connection.
- Updating the bandwidth and VCI value of the selected VPCI.

b) Outgoing call/connections from the non-assigning exchange to the assigning exchange.

The non-assigning exchange performs no assignment actions.

The assigning exchange performs the actions as in a).

c) Simultaneous call/connection request from the assigning exchange and the non-assigning exchange.

As the assigning exchange assigns bandwidth and the VCI value at the time of call/connection acceptance at the assigning exchange, a dual seizure of bandwidth or VCI value cannot occur.

Option 2

If an exchange has to set up a call/connection (also in the case of an automatic repeat attempt), it shall first use a VPCI which it is controlling and shall act as an assigning exchange, i.e. a Set_Up request primitive including the Connection element identifier parameter is issued. Only if there are no available resources, e.g. bandwidth, or VCIs related to the VPCIs that can support the requested traffic capabilities and which the exchange is controlling, the exchange acts as a non-assigning exchange, and it issues a Set_Up request primitive with the Exclusive connection element identifier parameter.

If an exchange is requested to set up a call/connection for which alternative, or minimum, cell rates are requested, or for which ABT is indicated in the Broadband Bearer Capability Parameter, the exchange shall:

- If available, use a VPCI for which it is the assigning exchange and set up the call using the original requested connection characteristics (PCR, SCR, MBS, RM PCR), i.e. a Set_Up request primitive including the connection element identifier parameter is issued. If present in the SETUP message, the alternative ATM cell rate is checked to see if this can be supported by the allocated resources. If the alternative ATM cell rate cannot be supported, then it is discarded.
- If the original requested connection characteristics cannot be supported using a VPCI for which it is the assigning exchange, do one of the following (depending upon routing results):
  - i) act as the non-assigning exchange, i.e. issue a Set_Up request primitive with the Exclusive connection element identifier parameter, using the originally requested connection characteristics; or
  - ii) issue a Set_Up request primitive using a VPCI for which it is the assigning exchange, requesting (as applicable):
    - either a cell rate between the original requested cell rate and the minimum ATM cell rate; or
    - the alternative ATM cell rate; or
  - iii) act as the non-assigning exchange and issue a Set_Up request primitive with the Exclusive connection element identifier parameter, requesting (as applicable):
    - either a cell rate between the original requested cell rate and the minimum ATM cell rate; or
    - the alternative ATM cell rate; or
  - iv) if neither i) nor ii) nor iii) is possible, i.e. no VPCI is available that can support the connection characteristics originally requested, or the minimum ATM cell rate or alternative ATM cell rate requested by the user, then the connection shall be released.

If an exchange receives a Set_Up indication primitive in which the alternative or minimum cell rates are specified, or in which ABT is indicated in the Broadband Bearer Capability Parameter, it shall do one of the following:

i) If possible, it shall accept the connection with the indicated VPCI using the original requested connection characteristics. The exchange checks the alternative ATM cell rate (if present) to see if this can be supported by the allocated resources. If not, then the alternative ATM cell rate is discarded.

ii) If the original requested connection characteristics cannot be supported on the indicated VPCI, it shall, if possible, accept the connection with (as applicable):

– either a cell rate between the original requested cell rate and the minimum ATM cell rate; or

– the alternative ATM cell rate.

iii) If neither i) nor ii) is possible, i.e. no VPCI is available that can support the requested connection characteristics, or the minimum ATM cell rate, or the alternative ATM cell rate requested by the user, then the connection shall be rejected.

If an exchange is requested to set up a call/connection for which ABR is indicated in the BroadBand Bearer Capability Parameter, the assigning exchange shall:

- If available, use a VPCI for which it is the assigning exchange and set up the call/connection using the original requested MCR, i.e. a Set_Up request primitive including the connection element identifier parameter is issued.
- If the original requested MCR cannot be supported using a VPCI for which it is the assigning exchange, do one of the following (depending on routing results):

  i) act as the non-assigning exchange, i.e. issue a Set_Up request primitive with the Exclusive connection element identifier parameter, using the originally requested connection characteristics; or

  ii) issue a Set_Up request primitive using a VPCI for which it is the assigning exchange, support a cell rate between the originally requested cell rate and the cell rate indicated in the minimum ATM cell rate parameter. If the requested PCR, ICR, TBE, RIF or RDF cannot be supported, the exchange shall adjust these values according to the rules given in Table 2-20;

  iii) act as the non-assigning exchange and issue a Set_Up request primitive with the Exclusive connection element identifier parameter, but requesting a cell rate between the original requested MCR and the MCR indicated in the minimum ATM cell rate parameter;

  iv) if neither i) nor ii) nor iii) is possible, then the connection shall be released with cause#37 "User cell rate not available".

If an exchange receives a Set_Up request primitive in which ABR is indicated in the BroadBand Bearer Capability Parameter, it shall do one of the following:

i) If possible, it shall accept the connection on the indicated VPCI using the original requested connection characteristics.

ii) If the original requested MCR cannot be supported on the indicated VPCI, it shall, if possible, accept the connection with a cell rate between the original requested MCR and the MCR indicated in the minimum ATM cell rate parameter.

iii) If nether i) nor ii) is possible, then the connection shall be released with cause #37 "User cell rate not available".

The assigning exchange assigns both VPCI and VCI for outgoing and incoming call/connections. The non-assigning exchange assigns only the VPCI and asks the assigning exchange to assign the VCI. Both exchanges assign traffic related resources, e.g. bandwidth, for the virtual connection.

a) Call/connection establishment from the assigning exchange to the non-assigning exchange.

The assigning exchange performs the following actions:

- It shall perform the CAC function and shall select one VPC from several available VPCs which can provide the requested resources, e.g. bandwidth, from its point of view according to the requested traffic parameters.
- The resources shall be reserved on the selected VPC for that connection.

- It shall also assign a VCI value to the connection and shall indicate the selected VPCI/VCI to the succeeding exchange in the Connection element identifier parameter.
- The reserved resources shall be related to the assigned VCI value.

The non-assigning exchange performs the following actions:

- It shall perform the CAC function and shall check whether it can provide the requested resources, e.g. bandwidth, on the indicated VPC from its point of view according to the requested traffic parameters.
- If it can provide the requested resources on the indicated VPC, it shall reserve the resources on the indicated VPC for that connection, and shall relate the reserved resources to the indicated VCI value.
- If it cannot provide the requested resources on the indicated VPC, it shall reject the connection with cause #37 "User cell rate not available".

b) Call/connection establishment from the non-assigning exchange to the assigning exchange.

The non-assigning exchange performs the following actions:

- It shall perform the CAC function and shall select one VPC from several available VPCs which can provide the requested resources, e.g. bandwidth, from its point of view according to the requested traffic parameters.
- The resources shall be reserved on the selected VPC for that connection.
- It shall indicate the selected VPCI to the succeeding exchange in the Exclusive connection element identifier parameter.
- When it receives the Incoming_Resources_Accepted indication primitive, it shall relate the reserved resources to the indicated VCI value.

The assigning exchange performs the following actions:

- It shall perform the CAC function and shall check whether it can provide the requested resources, e.g. bandwidth, on the indicated VPC from its point of view according to the requested traffic parameters.
- If it can provide the requested resources on the indicated VPC, it shall:
  - reserve the resources on the indicated VPC for that connection;
  - assign a VCI value to the connection and shall indicate the selected VPCI/VCI to the preceding exchange in the Connection element identifier parameter;
  - relate the reserved resources to the assigned VCI value.
- If it cannot provide the requested resources on the indicated VPC, it shall reject the connection with cause #37 "User cell rate not available".

c) Simultaneous call/connection request from the assigning exchange and the non-assigning exchange.

As the assigning exchange assigns the VCI value at the time of call/connection acceptance at the assigning exchange, a dual seizure of VCI value cannot occur.

Both exchanges can simultaneously request a call/connection using the same VPCI. In that case, each exchange performs the normal procedures and checks the availability of the requested resources, independent from the actions at the other exchange.

2.1.2.3 Abnormal conditions

For abnormal conditions of the one-side selection principle, the following procedures shall apply:

- If a Set_Up indication primitive with VPCI/VCI is received at the assigning exchange for that virtual path, an Incoming_Resources_Rejected request primitive shall be returned with cause #36 "VPCI/VCI assignment failure". The event shall be reported to management.

- If a Set_Up indication primitive without VPCI/VCI is received at an exchange which is non-assigning for all virtual paths between the sending and receiving exchanges, an Incoming_Resources_Rejected request primitive shall be returned with cause #36 "VPCI/VCI assignment failure". The event shall be reported to management.
- If an Incoming_Resources_Accepted indication primitive with VPCI/VCI is received at the assigning exchange for that virtual path, the event shall be reported to management. The call/connection shall be released using cause #36 "VPCI/VCI assignment failure".
- If an Incoming_Resources_Accepted indication primitive without VPCI/VCI is received at an exchange which sent a Set_Up request without the Connection Element Identifier parameter, the event shall be reported to management, and the call/connection shall be released using cause #36 "VPCI/VCI assignment failure".
- If an Incoming_Resources_Accepted indication primitive with VPCI/VCI is received at an exchange which sent a Set_Up request with the Connection Element Identifier parameter, the event shall be reported to management, and the call/connection shall be released using cause #36 "VPCI/VCI assignment failure".

For **Option 2** the following additional procedure applies:

- If in a Set_Up indication primitive an Exclusive connection element identifier parameter with VPCI is received at the non-assigning exchange for that virtual path, an Incoming_Resources_Rejected request primitive shall be returned with cause #36 "VPCI/VCI assignment failure". The event shall be reported to management.

2.1.2.4 Interworking with nodes supporting only the assignment procedures described in Capability Set 1

Option 1

Not applicable.

Option 2

Interworking with exchanges, which have implemented only the assignment procedures according to the Option 1 (those were exclusively used in the first release of ITU-T Q.2764), has to be taken into account. This affects the call/connection establishment from the non-assigning exchange to the assigning exchange. In order to provide a smooth interworking the instruction indicators for the Exclusive connection element identifier parameter shall be set to discard the parameter, and the following procedures shall be followed.

a) Call/connection establishment from a non-assigning exchange supporting Option 2 to an assigning exchange supporting only Option 1.

   The procedures of 2.1.2.2 b) shall be followed with the following exceptions and additions:

   - The assigning exchange does not recognize the Exclusive connection element identifier parameter. It will select a VPCI/VCI without taken into account the indicated VPCI.
   - If the non-assigning exchange receives an Incoming_Resources_Accepted indication primitive with a VPCI which is different from the one previously selected, it shall:
     – release the resources reserved for the previously selected VPCI;
     – again perform the CAC function and check whether it can provide the requested resources on the indicated VPCI from its point of view.

   If it can provide the requested resources on the indicated VPCI, it shall reserve the resources on the indicated VPC for that connection and relate the reserved resources to the indicated VCI value.

If it cannot provide the requested resources on the indicated VPCI, it shall release the connection in forward and backward direction with cause #37 "User cell rate not available".

b) Call/connection establishment from a non-assigning exchange supporting only Option 1 to an assigning exchange supporting Option 2.

- The non-assigning exchange does not select a VPCI and therefore the Exclusive connection element identifier parameter is not included in the Set_Up request primitive sent by the exchange.
- If the assigning exchange receives no Connection element identifier parameter nor an Exclusive connection element identifier parameter, it shall:
  - perform the CAC function and shall select one VPC from several available VPCs which can provide the requested resources, e.g. bandwidth, from its point of view according to the requested traffic parameters;
  - reserve the resources on the selected VPC for that connection;
  - assign a VCI value to the connection and shall indicate the selected VPCI/VCI to the preceding exchange in the Connection element identifier parameter;
  - relate the reserved resources to the assigned VCI value.

2.1.3 Cell Delay Variation Tolerance Indication

When the Cell Delay Variation Tolerance Indication capability is supported, the following shall apply:

- The possible inclusion of individual CDVT values in the Set_Up request/indication primitives are determined by the ATM Transfer Capability of the call/connection. The allowed individual CDVT values for each ATM Transfer capability are specified in ITU-T Q.2961.5.
- If the Set_Up indication primitive contains combinations of CDVT values which are not allowed for the requested ATC, the exchange shall release the connection with cause #73 "Unsupported combination of traffic parameters".
- The CDVT values which are applicable to a connection at an output/input port may be derived as a function of the CDVT values at the input/output port with other parameters like:
  - Resource Management/Connection Admission Control characteristics.
  - Resource Management status (e.g. traffic load) of the outgoing/incoming link.
  - Requested cell rate values.
  - Input and/or output traffic shaping characteristics.
- The support of this function is optional and is implementation dependent (for more information on traffic management see ITU-T I.371).
- In some cases, (see following subclauses), however, Resource Management based calculations cannot be done without taking into account other criteria to determine the output/input CDVT (e.g. determination of worst-case values or upper bounds (τ_{MAX}) in case of shaping being applied)).

Option 1

Default delta CDVT values are applied to each VPCI, which shall be known at both ends of the VPCI. The default delta CDVT values are representative of the CDVT values to be taken into account when the assigning exchange has received a Set_Up indication primitive from the preceding exchange. When an assigning exchange receives a Set_Up indication primitive from the preceding exchange, the CDVT values received have not taken into account the effect of the link between the two exchanges. The default delta CDVT values will then be taken into account for subsequent

processing of CDVT values and in calculations dependent upon the CDVT values within the assigning exchange.

Option 2

Default delta CDVT values are not required. The VPCI is always assigned by the preceding side.

When no information is available to determine the CDVT value, it is then said to be set to "default".

NOTE – The default τ_{MAX} value is network specific.

If no CDVT parameter is received in the Set_Up request primitive, the default values shall be assumed.

If no CDVT parameter is received in the answer indication primitive, for the backward CDVT the minimum of the default value and the received maximum backward CDVT value shall be assumed ($CDVT_b = Min\{ CDVT_{default,}\ CDVT_{b(MAX)} \}$). The maximum backwards CDVT value for that interface is the backwards CDVT value included in the Set_Up request primitive. If necessary, to comply with CDVT requirements, traffic shaping may be applied.

The procedures which are specified in the following subclauses are illustrated in Figure III.1.

2.2 Successful call/connection Set_Up

2.2.1 Forward address signalling – *En bloc*

2.2.1.1 Actions required at the originating exchange

a) *Virtual channel selection – Assigning exchange*

When the originating exchange has received the complete information from the calling party and has determined that the call/connection is to be routed to another exchange, route and virtual channel selection take place.

Appropriate routing information is either stored at the originating exchange or at a remote database to which a request is made.

The selection of the route will depend on the Called Party Number, Broadband Bearer Capability, ATM Cell Rate; and, when present, Additional ATM Cell Rate, Minimum ATM Cell Rate or Alternative ATM Cell Rate, and other optional requested traffic capabilities, such as QoS, and also on the outcome of the assignment procedures [see 2.1.2.2 a)]. Additionally, if the Maximum End-to-end Transit Delay parameter is present, this is used together with the Propagation Delay Counter. The selection process may be performed at the exchange or with the assistance of the remote database.

The exchange shall create an instance of the B-ISUP AE and issue the Set_Up request primitive to it.

The information used to determine the routing of the call/connection by the originating exchange will be included in the Set_Up request primitive to enable the correct routing at intermediate exchanges. The Set_Up request primitive implicitly confirms that performance parameter objectives have been met. It indicates the reservation of ATM connection elements.

b) *Virtual channel selection – Non-assigning exchange*

As for the assigning exchange except that the assignment procedure is according to 2.1.2.2 b).

c) *Address information sending sequence*

The sending sequence of address information on international call/connections will be the country code followed by the national (significant) number. On national connections, the address information may be the subscriber number or the national (significant) number as

required by the Administration concerned. For call/connections to international operator positions (Code 11 and Code 12) refer to ITU-T Recommendation Q.107.

The end of pulsing (ST) signal will be used whenever the originating exchange is in a position to know by digit analysis that the final digit has been sent.

d) *Set_Up request primitive – Issued by the assigning exchange*

The Set_Up request primitive in principle contains all the information that is required to route the call/connection to the destination exchange and connect the call/connection to the called party. The originating exchange shall include in the Set_Up request primitive the mandatory parameters listed in Table 2-2 and the Connection Element Identifier parameter.

The Set_Up request primitive can also transport parameters from the access unaltered to the destination, these are AAL Parameters, AAL prime parameters, Broadband Bearer Capability, Broadband Low Layer Information, Broadband High Layer Information, Narrow-band High Layer Compatibility, Narrow-band Bearer Capability, Narrow-band Low layer Compatibility, Notification, Report Type, Report Type prime, OAM Traffic Descriptor and Progress Indicator.

After issuing the Set_Up request primitive, a response, i.e. the Incoming_Resources_Accepted indication primitive or Incoming_Resources_Rejected indication primitive, is awaited.

If the AESA for called party parameter is present and the Address Format Identifier (AFI) of the AESA indicates an E.164 based address, then the following shall apply:

- the originating exchange shall include the AESA for called party parameter in the Set_Up request primitive. The Called party number parameter, containing only the E.164 part of the AESA, shall be used for routing the call.

If the minimum ATM cell rate parameter is present, then the following shall apply:

- If the exchange can support the requested connection characteristics, it will include the original requested connection characteristics, as well as the minimum ATM cell rate parameter in the Set_Up request primitive.
- Depending on routing conditions the following applies:
  - i) If the exchange cannot support the requested connection characteristics, but can support a cell rate between the requested cell rate and the minimum ATM cell rate, then the exchange performs the assignment procedures based on this cell rate, inserts this cell rate into the ATM cell rate parameter, and the additional ATM cell rate parameter if applicable, and includes the ATM cell rate, additional ATM cell rate if applicable, and minimum ATM cell rate parameters in the Set_Up request primitive.
  - ii) If the exchange can support only the minimum ATM cell rate, then the exchange performs the assignment procedures based on this cell rate, inserts this cell rate into the ATM cell rate parameter, and the additional ATM cell rate parameter if applicable, and includes only the ATM cell rate parameter, and the additional ATM cell rate parameter if applicable, in the Set_Up request primitive.
  - iii) If the exchange cannot support the connection characteristics requested by the user, and also cannot support the minimum ATM cell rate requested by the user, the connection shall be released with cause #37 "User cell rate not available".

If the alternative ATM cell rate parameter is present, then the following shall apply:

- If the exchange can support the requested connection characteristics, it will include the original requested connection characteristics, as well as the alternative ATM cell rate parameter in the setup request primitive. The exchange checks the alternative ATM cell rate parameter to see if this can be supported by the allocated resources. If not, then the alternative ATM cell rate parameter is discarded.
- Depending on routing conditions, the following applies:
  - If the exchange cannot support the requested connection characteristics, but can support the alternative ATM cell rate, then the exchange performs the assignment procedures based on this cell rate, and inserts this value into the ATM cell rate parameter and additional ATM cell rate parameter (if applicable) in the setup request primitive, and discards the alternative ATM cell rate parameter.
  - If the exchange cannot support the connection characteristics requested by the user, and also cannot support the alternative ATM cell rate requested by the user, the connection shall be released with cause #37 "User cell rate not available".

If the exchange has to set up a call/connection for which the ABR capability is indicated in the Broadband bearer capabilities, then the following shall apply:

- the originating exchange will include the ATC setup parameters parameter, additional ATM cell rate parameter, and, if applicable, the minimum ATM cell rate parameter in the Set_Up request primitive. The ATM cell rate parameter will indicate the peak cell rate of the connection and will always be present. If the exchange can support the indicated MCR, PCR and ICR, it will include the original requested connection characteristics in the Set_Up request primitive.

If the exchange cannot support the requested MCR and the corresponding minimum ATM cell rate parameter is included in the Set_Up request primitive, then the MCR can be negotiated using the procedures for the minimum ATM cell rate parameter.

If the exchange cannot support the requested MCR and the corresponding minimum ATM cell rate parameter is not included in the Set_Up request primitive, then the connection shall be released with cause #37 "User cell rate not available".

If the exchange cannot provide the requested PCR, but is able to provide at least the MCR, the exchange shall progress the call after adjusting the PCR value in the ATM cell rate parameter. The adjusted PCR value will be greater than or equal to the MCR value. Otherwise, the call shall be released with cause #37 "User cell rate not available".

The exchange may adjust the following ABR parameters: ICR, TBE, RIF and RDF.

The FRT shall be increased by the switch internal RM cell delay and the RM cell delay value assigned to the selected VPC to the succeeding exchange.

NOTE 1 – The RM cell delay for the forward and backward direction is added.

If the exchange has to set up a call/connection for which Frame Relay is to be supported, then the following shall apply:

- If Link layer core parameters parameter or Link layer protocol parameters parameter are received, all types of exchanges shall transfer them transparently.

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the following shall apply:

- The exchange shall determine the forward CDVT values which are applicable at the output port based on the forward CDVT values received in a Set_Up indication primitive from a preceding exchange or from the calling party or from the assumed

default values. This may be achieved using resource management based calculations (see 2.1.3)[2].

- The exchange shall determine the maximum backward CDVT values it can handle and that can match the maximum backward CDVT values received from the preceding exchange or that can match the assumed default values[3].
- Resource allocation in the forward/backward direction shall take these CDVT into account.
- The locally updated CDVT values shall be included in the Set_Up request primitive issued towards the succeeding exchange.

e) *Set_Up request primitive – Issued by the non-assigning exchange*

Option 1

With regard to the issuing of the Set_Up request primitive by the non-assigning exchange, the same procedures as for the assigning exchange are applicable, with the exception that the Connection Element Identifier shall not be included in the Set_Up request primitive.

If the exchange has to set up a call/connection for which the ABR capability is indicated in the Broadband bearer capabilities, then the following is additionally applicable:

- The exchange passes the received additional ATM cell rate parameter and the ATC setup parameters parameter in the Set_Up request primitive.
- The FRT shall be increased by the switch internal RM cell delay only.

  NOTE 2 – The RM cell delay for the forward and backward direction is added.

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the following shall additionally apply:

- The resource calculations for the output port are not taken into account until the output port is known at the receipt of the Incoming Resources Accepted indication primitive.
- The resource calculations shall take into account the default delta forward and backward CDVT values for the assigned VPCI (see 2.1.3 for RM calculations).

Option 2

With regard to the issuing of the Set_Up request primitive by the non-assigning exchange, the same procedures as for the assigning exchange are applicable, with the exception that the Exclusive connection element identifier parameter shall be included in the Set_Up request primitive instead of the Connection element identifier parameter.

If the exchange has to set up a call/connection for which the ABR capability is indicated in the Broadband bearer capabilities, then the following is additionally applicable:

- The FRT shall be increased by the switch internal RM cell delay only.

  NOTE 3 – The RM cell delay for the forward and backward direction is added.

f) *Completion of transmission path*

For connections susceptible to information/speech clipping, through connection will be completed in the backward direction at the originating exchange immediately after receiving of the Incoming_Resources_Accepted indication primitive. Optionally, through connection may occur in both directions.

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[2] The forward CDVT value is in general increased, unless traffic shaping is applied.

[3] The maximum backward CDVT value is in general decreased unless traffic shaping is applied.

For all connections, through connection in both directions shall be completed not later than on receipt of an Answer indication. Through connect shall not occur before receipt of Incoming_Resources_Accepted indication primitive.

2.2.1.2 Actions required at an intermediate national exchange

2.2.1.2.1 Incoming side of the exchange

a) *Assigning exchange*

Option 1

After receiving a Set_Up indication primitive, an assigning exchange shall perform the assignment procedure for VPCI/VCI and bandwidth as described in 2.1.2.2 b). If this is successful the Incoming_Resources_Accepted request primitive shall be issued immediately. The Incoming_Resources_Accepted request primitive shall include the mandatory parameters listed in Table 2-4, including the Connection Element Identifier parameter.

If the exchange has to set up a call/connection for which the minimum ATM cell rate parameter is included in the Set_Up indication primitive, the following shall apply:

- If the exchange can support the requested connection characteristics, it will allocate the resources according to the procedures to be followed when the minimum ATM cell rate parameter is not included in the Set_Up indication primitive.
- If the exchange cannot support the requested connection characteristics, but can support a cell rate between the requested cell rate and the minimum ATM cell rate, including the minimum ATM cell rate, then the exchange does VPCI/VCI selection and bandwidth allocation based on the supportable cell rate. If this cell rate is not the minimum ATM cell rate, then this cell rate is used as the ATM cell rate in subsequent processing, together with the minimum ATM cell rate; otherwise, the minimum ATM cell rate is not passed and this cell rate is used as the ATM cell rate for subsequent processing.
- If the exchange only supports the minimum ATM cell rate, then the exchange does VPCI/VCI selection and bandwidth allocation based on this cell rate. This cell rate is used as the ATM cell rate in subsequent processing, and the minimum ATM cell rate parameter is not passed.
- If the exchange cannot support the connection characteristics requested by the user, and also cannot support the minimum ATM cell rate requested by the user, the connection shall be released with cause #37 "User cell rate not available".

If the exchange has to set up a call/connection for which the alternative ATM cell rate parameter is included in the Set_Up indication primitive, the following shall apply:

- If the exchange can support the requested connection characteristics, it will allocate resources according the procedures to be followed when the alternative ATM cell rate parameter is not included in the Set_Up indication primitive. If the exchange cannot support the cell rates requested in the alternative ATM cell rate parameter, then the alternative ATM cell rate parameter shall be discarded.
- If the exchange cannot support the requested connection characteristics, but can support the alternative ATM cell rate, then the exchange does VPCI/VCI selection and the bandwidth allocation according to the alternative ATM cell rate. This bandwidth allocation is used in subsequent processing, and the alternative ATM cell rate parameter shall not be passed.
- If the exchange cannot support the connection characteristics requested by the user, and also cannot support the alternative ATM cell rate requested by the user, the connection shall be released with cause #37 "User cell rate not available".

If the exchange has to set up a call/connection for which the ABR capability is indicated in the Broadband bearer capabilities, then the following shall apply:

- The Set_Up request primitive will include the ATC setup parameters parameter, additional ATM cell rate parameter, and the minimum ATM cell rate parameter. The ATM cell rate parameter, and additional ATM cell rate parameter if required, will indicate the peak cell rate of the connection and will always be present. If the exchange can support the requested connection characteristics, it will allocate resources accordingly.
- If the exchange cannot support the requested MCR and the corresponding minimum ATM cell rate parameter is included in the Set_Up request primitive, then the MCR can be negotiated for the minimum ATM cell rate parameter.
- If the exchange cannot provide the requested PCR, but is able to provide at least the MCR, the exchange shall progress the call after adjusting the PCR value in the ATM cell rate parameter, and in the additional ATM cell rate parameter if applicable, provided that, after adjustment, the PCR value is greater than or equal to the MCR value.
- The exchange may adjust the following ABR parameters: ICR, TBE, RIF and RDF.
- The FRT shall be increased by the switch internal RM cell delay and the RM cell delay value assigned to the selected VPC to the succeeding exchange.

  NOTE 1 – The RM cell delay for the forward and backward direction is added.

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the following shall additionally apply:

- Resource allocation in forward direction shall be done using the forward CDVT values received in the Set_Up indication primitive, or from the calling party, and the default delta forward CDVT values for the assigned VPCI, or using the assumed default values. Resource allocation in backward direction shall be done using the maximum backward CDVT values received in the Set_Up indication primitive, or from the calling party, and the default delta backward CDVT values for the assigned VPCI, or the assumed default values. The default delta CDVT[4] values for the assigned CDVT values shall be taken into account, in addition to the CDVT values received in the Set_Up indication primitive or the calling party, for subsequent processing in the exchange.

Option 2

After receiving a Set_Up indication primitive, an assigning exchange shall perform the assignment procedure as described in 2.1.2.2 b). If this is successful the Incoming_Resources_Accepted request primitive shall be issued immediately. The Incoming_Resources_Accepted request primitive shall at a minimum include the mandatory parameters listed in Table 2-4, including the Connection Element Identifier parameter.

If the exchange has to set up a call/connection for which the minimum ATM cell rate parameter is included in the Set_Up indication primitive, the following shall apply:

- If the exchange can support the requested connection characteristics, it shall allocate resources using normal procedures.
- If the exchange cannot support the requested connection characteristics, but can support a cell rate between the requested cell rate and the minimum ATM cell rate, then the exchange performs the assignment procedures based on this cell rate. This cell rate is used as the (additional) ATM cell rate in subsequent processing, together with the minimum ATM cell rate.

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[4] The default delta CDVT value is implementation dependent.

- If the exchange only supports the minimum ATM cell rate, then the exchange performs the assignment procedures based on this cell rate. This cell rate is used as the (additional) ATM cell rate in subsequent processing, and the minimum ATM cell rate is not passed.
- If the exchange cannot support the connection characteristics requested by the user, and also cannot support the minimum ATM cell rate requested by the user, the connection shall be released with cause #37 "User cell rate not available".

If the exchange has to set up a call/connection for which the alternative ATM cell rate parameter is included in the Set_Up indication primitive, the following shall apply:

- If the exchange can support the requested connection characteristics, it will allocate resources using normal procedures. The exchange checks the alternative ATM cell rate to see if this can be supported by the allocated resources. If not, then the alternative ATM cell rate is discarded.
- If the exchange cannot support the requested connection characteristics, but can support the alternative ATM cell rate, then the exchange performs the assignment procedures based on these values. These values are used in the (additional) ATM cell rate in subsequent processing, and the alternative ATM cell rate is not passed.
- If the exchange cannot support the connection characteristics requested by the user, and also cannot support the alternative ATM cell rate requested by the user, the connection shall be released with cause #37 "User cell rate not available".

If the exchange has to set up a call/connection for which the ABR capability is indicated in the Broadband bearer capabilities, then the following shall apply:

- If the exchange can support the requested connection characteristics, it will allocate resources accordingly.
- If the exchange cannot support the requested MCR and the corresponding minimum ATM cell rate parameter is included in the Set_Up indication primitive, then the MCR can be negotiated using the procedures described in ITU-T Recommendation Q.2725.1 for the minimum ATM cell rate parameter.
- If the exchange cannot support the requested MCR and the corresponding minimum ATM cell rate parameter is not included in the Set_Up request primitive, then the connection shall be released with cause #37 "User cell rate not available".
- If the exchange cannot provide the requested PCR, but is able to provide at least the MCR, the exchange shall progress the call after adjusting the PCR value in the ATM cell rate parameter. The adjusted PCR value will be greater than or equal to the MCR value. Otherwise, the call shall be released with cause #37 "User cell rate not available".
- The exchange may adjust also the following ABR setup parameters: ICR, TBE, RIF and RDF.
- The FRT shall be increased by the RM cell delay value assigned to the selected VPC to the preceding exchange.

  NOTE 2 – The RM cell delay for the forward and backward direction is added.

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the following shall additionally apply:

- Resource allocation in forward direction shall be done using the forward CDVT values received in the Set_Up indication primitive, or from the calling party, or using the assumed default values. Resource allocation in backward direction shall be done using the maximum backward CDVT values received in the Set_Up indication primitive, or from the calling party, or the assumed default values.

b) *Non-assigning exchange*

Option 1

After receiving a Set_Up Indication primitive, a non-assigning exchange shall issue the Incoming_Resources_Accepted request primitive immediately. The Incoming_Resources_Accepted request primitive shall include the mandatory parameters listed in Table 2-4, without the Connection Element Identifier parameter.

Option 2

After receiving a Set_Up Indication primitive, a non-assigning exchange shall perform the assignment procedure as described in 2.1.2.2 a). If this is successful the Incoming_Resources_Accepted request primitive shall be issued immediately. The Incoming_Resources_Accepted request primitive shall at a minimum include the mandatory parameters listed in Table 2-4, without the Connection Element Identifier parameter.

If the exchange has to set up a call/connection for which the minimum ATM cell rate parameter or alternative ATM cell rate parameter is included in the Set_Up indication primitive, or for which the ABR capability is indicated in the Broadband Bearer capabilities parameter, then the same procedures as for the assigning exchange are applicable with the exception that the FRT is not changed.

2.2.1.2.2 Other actions at the exchange

a) *Virtual channel selection*

After the issuing of the Incoming_Resources_Accepted request primitive, an intermediate national exchange will analyse the called party number and the other routing information (see 2.2.1.1) to determine the routing of the call/connection. If the intermediate national exchange can route the call/connection, it shall create an instance of the B-ISUP AE and issue a Set_Up request primitive to it. The exchange shall follow the assignment procedure for VPCI/VCI and bandwidth as described in see 2.1.2.2.

b) *Parameters in the Set_Up request primitive – Issued by the assigning exchange*

Signalling information is passed on transparently if not specified otherwise (i.e. Propagation Delay).

The exchange shall include the mandatory parameters included in Table 2-2 and the Connection Element Identifier parameter.

After issuing the Set_Up request primitive, a response, i.e. the Incoming_Resources_Accepted indication primitive or Incoming_Resources_Rejected indication primitive are awaited.

c) *Set_Up Request primitive – Issued by the non-assigning exchange*

Option 1

With regard to the issuing of the Set_Up request primitive by the non-assigning exchange, the same procedures as for the assigning exchange are applicable, with the exception that the Connection Element Identifier shall not be included in the Set_Up request primitive.

Option 2

With regard to the issuing of the Set_Up request primitive by the non-assigning exchange, the same procedures as for the assigning exchange are applicable, with the exception that the Exclusive connection element identifier parameter shall be included in the Set_Up request primitive instead of the Connection element identifier parameter.

d) *Completion of transmission path*

For connections susceptible to information/speech clipping, through connection will be completed in both directions at an intermediate exchange immediately after receiving of the Incoming_Resources_Accepted indication primitive.

For all connections, through connection in both directions shall be completed not later than on receipt of an Answer indication. Through connect shall not occur before receipt of Incoming_Resources_Accepted indication primitive.

2.2.1.3 Actions required at an outgoing international exchange

2.2.1.3.1 Incoming side of the exchange

See 2.2.1.2.1.

2.2.1.3.2 Other actions at the exchange

a) *Virtual channel selection*

See 2.2.1.2.2 a).

b) *Parameters in the Set_Up request primitive – Issued by the assigning exchange*

See 2.2.1.2.2 b), with the following additions:

- The end of pulsing (ST) signal will be used whenever the outgoing international exchange is in a position to know by digit analysis that the final digit has been sent. The most significant digits in the called party number may be amended or omitted (country code is removed at the last exchange before the incoming international exchange).
- If the outgoing international exchange belongs to a country using μ-law PCM encoding nationally and the Set-Up indication included a Narrow-band Bearer Capability parameter indicating Speech or 3.1 kHz audio using "Recommendation G.711 μ–law" as the user information layer 1 protocol, this must be changed to "Recommendation G.711 A-law" and μ-law to A-law conversion enabled.
- If a Location Number parameter is received, the Nature of Address indicator is checked. If the Nature of Address indicator is set to "international number" then the parameter is passed on unchanged, otherwise the number is modified to the international number format and the nature of address is set to "international number" before being passed.
- The outgoing international gateway exchange shall include the Origination ISC Point Code parameter in the Set_Up request primitive. This information is used for statistical purposes, e.g. accumulation of the number of incoming call/connections on an originating international switching centre basis.

c) *Parameters in the Set_Up request primitive – Issued by the non-assigning exchange*

See 2.2.1.2.2 c) in the addition to 2.2.1.3.2 b).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.1.4 Actions required at an intermediate international exchange

2.2.1.4.1 Incoming side of the exchange

See 2.2.1.2.1.

2.2.1.4.2 Other actions at the exchange

a) *Virtual channel selection*

See 2.2.1.2.2 a).

b) *Parameters in the Set_Up request primitive – Issued by the assigning exchange*

See 2.2.1.2.2 b), with the following addition:

- The most significant digits in the called party number may be amended or omitted (country code is removed at the last exchange before the incoming international exchange).

c) *Parameters in the Set_Up request primitive – Issued by the non-assigning exchange*

See 2.2.1.2.2 c), in the addition to 2.2.1.4.2 b).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.1.5 Actions required at an incoming international exchange

2.2.1.5.1 Incoming side of the exchange

See 2.2.1.2.1, with the following additions.

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the following shall additionally apply:

– An incoming international exchange may release a call, if forward CDVT values are not conforming to the maximum CDVT allowed by the NPC function, according to the procedures specified in 2.3.1 "Lack of resources at incoming side" with cause #37 "user cell rate not available".

2.2.1.5.2 Other actions at the exchange

a) *Virtual channel selection*

See 2.2.1.2.2 a).

b) *Parameters in the Set_Up request primitive – Issued by the assigning exchange*

See 2.2.1.2.2 b) with the following additions:

- The incoming international gateway exchange shall delete the Origination ISC Point Code parameter from the Set_Up indication primitive and set up a call/connection to the national network. This information is used for statistical purposes, e.g. accumulation of the number of incoming call/connections on an originating international switching centre basis.
- The incoming international exchange shall generate the national/international call indicator with international call indication.
- If the incoming international exchange belongs to a country using μ-law PCM encoding nationally and the Set_Up indication included a Narrow-band Bearer Capability parameter indicating Speech or 3.1 kHz audio using "Recommendation G.711 A-law" as the user information layer 1 protocol, this must be changed to "Recommendation G.711 μ-law" and A-law to μ-law conversion enabled.

c) *Parameters in the Set_Up request primitive – Issued by the non-assigning exchange*

See 2.2.1.2.2 c) in the addition to 2.2.1.5.2 b).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.1.6 Actions required at the destination exchange

After the issuing of the Incoming_Resources_Accepted request primitive (see 2.2.1.2.1), the destination exchange will analyse the called party number to determine to which party the call/connection should be connected. It will also check the called party's access condition and

perform various checks to verify whether or not the connection is allowed. These checks will include correspondence of compatibility checks, e.g. checks associated with supplementary services.

If the connection is allowed, the destination exchange will proceed to offer the call/connection to the called party.

If the Set_Up indication primitive contains information from the access carried in the parameters mentioned in 2.2.1.1, it is transferred unaltered in the indication sent to the called user, as specified in ITU-T Recommendation Q.2650.

If the called user has subscribed to the relevant supplementary service, the indication sent to the user has to include the Called party number information. ITU-T Q.2951.9 specifies the format in which the called party number, i.e. called user depending on the applicable combinations or received called party number parameter(s) and address presentation format subscribed at the destination UNI.

2.2.1.7 Called party number for operator calls

International gateways should support access to operators equipment as specified in ITU-T Recommendation Q.101.

The sending sequence of specific forward address information to be sent for calls to operators (incoming, delay or particular delay operator) is shown below. The other parameters of the Set_Up request primitive are coded as the ones for an automatic call Set_Up request primitive.

2.2.1.7.1 International transit operator call

Called party number:

Nature of address indicator: "international number".

Address:
- country code: (1, 2, or 3 digits);
- extra digit designating the incoming international exchange N1 (Note 1);
- access to operator's position: Code 11 or Code 12 or special number (Note 2);
- number of a particular position: x1 (x2x3 ...);
- sending finished: ST.

NOTE 1 – The extra digit (N1) designating the incoming international exchange is used in cases where more than one incoming international exchange can be reached in the country of destination. The insertion of the extra digit is not mandatory (see ITU-T Recommendation Q.107).

NOTE 2 – The incoming operator or the delay operator may be obtained by using a special number (see ITU-T Recommendation Q.101).

Calling party category:

- "operator, language French";
- "operator, language English";
- "operator, language German";
- "operator, language Russian";
- "operator, language Spanish".

2.2.1.7.2 International terminal operator call

Called party number:

Nature of address indicator: "national (significant) number".

Address:
- extra digit designating the incoming international exchange N1 (Note 1, 2.2.1.7.1);
- access to operator's position: Code 11 or 12 or special number (Note 2, 2.2.1.7.1);
- number of a particular position: x1 (x2x3 ...);

– sending finished: ST.

Calling party category:

- "operator, language French";
- "operator, language English";
- "operator, language German";
- "operator, language Russian";
- "operator, language Spanish".

2.2.1.8 Called number for calls to testing and measuring devices

This subclause only describes the standard sending sequence of forward address information in the case of calls to testing and measuring devices.

Called party number:

Nature of address indicator: "national (significant) number".

Address:
– access code for particular testing or measuring device: XY (as given in ITU-T Recommendation Q.107) or access code N1 ... Nn based on bilateral agreements;
– sending finished: ST.

Calling party category:

- "test call"

NOTE – The principles in ITU-T Recommendation Q.107 are not always applicable to the international network.

In international accounts, tests should be deducted according to ITU-T Recommendation D.390 R.

2.2.2 Forward address signalling – AESA

2.2.2.1 Actions required at the originating exchange

a) *Virtual channel selection – Assigning exchange*

When the originating exchange has received the complete information from the calling party and has determined that the call/connection is to be routed to another exchange, route and virtual channel selection take place.

Appropriate routing information is either stored at the originating exchange or at a remote database to which a request is made.

The selection of the route will depend on the AESA for Called Party, Broadband Bearer Capability, ATM Cell Rate; and, when present, Additional ATM Cell Rate, Minimum ATM Cell Rate or Alternative ATM cell rate, and other optional requested traffic capabilities, and also on the outcome of the assignment procedure, [see 2.1.2.2 a)]. Additionally, if the Maximum End-to-end Transit Delay parameter is present, this is used together with the Propagation Delay Counter. The selection process may be performed at the exchange or with the assistance of the remote database.

When both the Called Party number parameter (without digits) and the AESA for Called Party parameter are present, then the AESA for Called Party parameter will be used for the selection of the route. Both the parameters shall be included in the Set_Up request primitive.

The exchange shall create an instance of the B-ISUP AE and issue the Set_Up request primitive to it.

The information used to determine the routing of the call/connection by the originating exchange will be included in the Set_Up request primitive to enable the correct routing at intermediate exchanges. The Set_Up request primitive implicitly confirms that performance

parameter objectives have been met. It indicates the reservation of ATM connection elements.

The Called Party number parameter shall be included in the Set_Up request primitive. When routing only on AESA for called party parameter, then the Called Party number parameter shall be forwarded without digits.

If both the AESA for called party parameter and Called party number parameter (with digits) are present, then the Called party number parameter shall be used for the selection of the route as described in 2.2.1.1.

b) *Virtual channel selection – Non-assigning exchange*

As for the assigning exchange except that the assignment procedure is according to 2.1.2.2 b).

c) *Address information sending sequence*

The sending sequence of address information other than the AESA, refer to 2.2.1.1 c).

d) *Set_Up request primitive – Issued by the assigning exchange*

See 2.2.1.1 d) using the AESA for the Called party parameter in place of the Called party number parameter.

e) *Set_Up request primitive – Issued by the non-assigning exchange*

As in 2.2.1.1 e).

f) *Completion of transmission path*

As in 2.2.1.1 f).

2.2.2.2 Actions required at an intermediate national exchange

2.2.2.2.1 Incoming side of the exchange

a) *Assigning exchange*

As in 2.2.1.2.1 a).

b) *Non-assigning exchange*

As in 2.2.1.2.1 b).

2.2.2.2.2 Other actions at the exchange

a) *Virtual channel selection*

As in 2.2.1.2.2 a) with the exception that an intermediate national exchange shall analyse the AESA for called party for the determination of the routing of the call/connection.

If both the AESA for called party parameter and Called party number parameter (with digits) are present, then the Called party number parameter shall be used for the determination of the routing of the call/connection as described in 2.2.1.2.2 a).

b) *Parameters in the Set_Up request primitive – Issued by the assigning exchange*

As in 2.2.1.2.2 b) with the addition that the AESA for called party parameter shall be included.

c) *Set_Up Request primitive – Issued by the non-assigning exchange*

As in 2.2.1.2.2 c).

d) *Completion of transmission path*

As in 2.2.1.2.2 d).

2.2.2.3 Actions required at an outgoing international exchange

2.2.2.3.1 Incoming side of the exchange

See 2.2.2.2.1.

2.2.2.3.2 Other actions at the exchange

a) *Virtual channel selection*

See 2.2.2.2.2 a).

b) *Parameters in the Set_Up request primitive – Issued by the assigning exchange*

See 2.2.2.2.2 b), with the following additions:

- If the outgoing international exchange belongs to a country using μ-law PCM encoding nationally and the Set-Up indication included a Narrow-band Bearer Capability parameter indicating Speech or 3.1 kHz audio using "Recommendation G.711 μ–law" as the user information layer 1 protocol, this must be changed to "Recommendation G.711 A-law" and μ-law to A-law conversion enabled.
- If a Location Number parameter is received, the Nature of Address indicator is checked. If the Nature of Address indicator is set to "international number" then the parameter is passed on unchanged, otherwise the number is modified to the international number format and the nature of address is set to "international number" before being passed.
- The outgoing international gateway exchange shall include the Origination ISC Point Code parameter in the Set_Up request primitive. This information is used for statistical purposes, e.g. accumulation of the number of incoming call/connections on an originating international switching centre basis.

c) *Parameters in the Set_Up request primitive – Issued by the non-assigning exchange*

See 2.2.2.2.2 c) in addition to 2.2.2.3.2 b).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.2.4 Actions required at an intermediate international exchange

2.2.2.4.1 Incoming side of the exchange

See 2.2.2.2.1.

2.2.2.4.2 Other actions at the exchange

a) *Virtual channel selection*

See 2.2.2.2.2 a).

b) *Parameters in the Set_Up request primitive – Issued by the assigning exchange*

See 2.2.2.2.2 b).

c) *Parameters in the Set_Up request primitive – Issued by the non-assigning exchange*

See 2.2.2.2.2 c). If both the AESA for called party parameter and Called party number parameter (with digits) are present, see 2.2.1.2.2 c) in addition to 2.2.1.4.2 b).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.2.5 Actions required at an incoming international exchange

2.2.2.5.1 Incoming side of the exchange

See 2.2.2.2.1.

2.2.2.5.2 Other actions at the exchange

a) *Virtual channel selection*

See 2.2.2.2.2 a).

b) *Parameters in the Set_Up request primitive – Issued by the assigning exchange*

See 2.2.2.2.2 b) in addition to 2.2.1.5.2 b).

c) *Parameters in the Set_Up request primitive – Issued by the non-assigning exchange*

See 2.2.1.2.2 c) in addition to 2.2.1.5.2 b).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.2.6 Actions required at the destination exchange

As in 2.2.1.6 with the following change:

- A destination exchange shall analyse the AESA for called party, when it is present in the Set_Up primitive, for the determination of which party the call/connection should be connected.

2.2.2.7 AESA for called party for operator calls

AESA for called party is not excluded for operator calls.

2.2.2.8 AESA for called party for calls to testing and measuring devices

The AESA for called party is not excluded for calls to testing and measuring devices.

2.2.2.9 Interworking with exchanges which do not support AESA based routing

When interworking with nodes that do not support routing on AESA for called party parameter, the call shall be routed through those nodes based on the contents of the Called party number parameter and the AESA for called party number parameter shall be transported. To support this, the following shall apply for the preceding interworking exchange:

- If only the Called party number parameter, with digits, is present, the Called party number parameter shall be forwarded to the succeeding exchange.
- If the AESA for called party parameter is present and the Called party number parameter contains no digits, the exchange shall do one of the following:
  1) Translate the non-E.164 AESA format to an E.164 address and populate the Called party number parameter. Both the AESA for called party parameter and the Called party number parameter shall be forwarded to the succeeding exchange. The instruction indicators for the AESA for called party parameter shall be set to pass the parameter as indicated in Appendix II.
  2) As a network option, use the Transit Network Selection (TNS) parameter for routing the call to the specified carrier.
  3) If neither an E.164 address can be generated from the contents of the AESA for called party parameter nor a TNS is received, the call/connection shall be released with cause#3 "No route to destination".
- If both the Called party number parameter and AESA for called party parameter with digits are present, both the AESA for called party parameter and the Called party number parameter shall be forwarded to the succeeding exchange. The instruction indicators for the AESA for called party parameter shall be set to pass the parameter as indicated in Appendix II.

Appendix IV provides some examples of interworking scenarios for non-E.164 AESA received in the Called party number IE.

2.2.3 Forward address signalling – Overlap operation

The Overlap operation method of forward address signalling is only relevant for (emulated) N-ISDN services.

2.2.3.1 Actions required at the originating exchange

a) *Virtual channel selection – Assigning exchange*

As in 2.2.1.1 a).

b) *Virtual channel selection – Non-assigning exchange*

As in 2.2.1.1 b).

c) *Address information sending sequence*

As in 2.2.1.1 c).

d) *Content of Set_Up, and Subsequent_Address request Primitives – Issued by the assigning exchange*

The Set_Up, and Subsequent_Address request primitives contain all the information that is required to route the call/connection to the destination exchange and connect the call/connection to the called party. The contents of the Set_Up request primitive is the same as described in 2.2.1.1 d). The only purpose of the Subsequent_Address request primitive is to carry further digits.

Within national networks the address information contained within the Set_Up request primitive may vary depending on the routing requirement within the network.

The remaining digits of the number may be sent in Subsequent_Address request primitives containing one or several digits as they are received. Efficiency can be gained by grouping together as many digits as possible. However, to prevent an increase in post sending delay in those cases where overlap operation with subscribers' dialling is used, it may be desirable to send the last few digits individually. The first Subsequent_Address request primitive must not be issued before the receipt of the Incoming_Resources_Accepted indication primitive.

The Subsequent_Address request primitive shall include the mandatory parameters included in Table 2-6.

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

- semi-automatic calls;
- test calls; and
- when the end-of-pulsing (ST) signal is received.

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

e) *Content of Set_Up, and Subsequent_Address request primitives – Issued by the non-assigning exchange*

As in 2.2.1.1 e).

f) *Completion of transmission path*

As in 2.2.1.1 f).

2.2.3.2 Actions required at an intermediate national exchange

2.2.3.2.1 Incoming side of the exchange

a) *Assigning exchange*

After receiving a Set_Up indication primitive, an assigning exchange shall perform the assignment procedure for VPCI/VCI and bandwidth as described in 2.1.2.2 b). If this is successful the Incoming_Resources_Accepted request primitive shall be issued immediately. The Incoming_Resources_Accepted request primitive shall include the mandatory parameters listed in Table 2-4 and include the Connection Element Identifier parameter.

b) *Non-assigning exchange*

Option 1

After receiving a Set_Up indication primitive, a non-assigning exchange shall issue the Incoming_Resources_Accepted request primitive. The Incoming_Resources_Accepted request primitive shall include the mandatory parameters listed in Table 2-4 without the Connection Element Identifier parameter.

Option 2

After receiving a Set_Up Indication primitive, a non-assigning exchange shall perform the assignment procedure as described in 2.1.2.2 a). If this is successful the Incoming_Resources_Accepted request primitive shall be issued immediately. The Incoming_Resources_Accepted request primitive shall at a minimum include the mandatory parameters listed in Table 2-4, without the Connection Element Identifier parameter.

2.2.3.2.2 Other actions at the exchange

a) *Virtual channel selection*

After the issuing of the Incoming_Resources_Accepted request primitive, an intermediate national exchange will analyse the called party number and the other routing information [see 2.2.1.1 a)] to determine the routing of the call/connection. If the intermediate national exchange can route the call/connection, it shall create an instance of the B-ISUP AE and issue a Set_Up request primitive to it. The exchange shall follow the assignment procedure for VPCI/VCI and bandwidth as described in 2.1.2.2.

If the number of the digits in the called party number is not sufficient to route the call/connection, the routing will be carried out when the intermediate national exchange has received additional digits in Subsequent_Address indication primitive(s). Any address digits received in Subsequent_Address indication primitives during the virtual channel selection process may be included in this Set_Up request primitive. Any Subsequent_Address indication primitives received after the Set_Up request primitive has been sent are forwarded as Subsequent_Address request primitive(s), after the Incoming_Resources_Accepted indication primitive has been received.

b) *Parameters in the Set_Up, and Subsequent_Address request primitives – Issued by the assigning exchange*

See 2.2.3.1 d).

c) *Parameters in the Set_Up, and Subsequent_Address request primitives – Issued by the non-assigning exchange*

See 2.2.3.1 e).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.3.3 Actions required at an outgoing international exchange

2.2.3.3.1 Incoming side of the exchange

See 2.2.1.2.1.

2.2.3.3.2 Other actions at the exchange

a) *Virtual channel selection*

See 2.2.3.2.2 a).

b) *Parameters in the Set_Up, and Subsequent_Address request primitives – Issued by the assigning exchange*

See 2.2.3.1 d), with the following additions:

- All digits required for routing the call/connection through the international network will be included in the Set_Up request primitive. On call/connections with a country code in the number (except in the case of call/connections to special operators), the Set_Up request primitive will contain a minimum of four digits and should contain as many digits as are available.
- Digit analysis may consist of an examination of the country code and counting the maximum or fixed number of digits of the national number.
- In other cases, the ST signal is not sent and the end of address information is determined by the receipt of the Address_Complete or Answer indication primitive from the incoming exchange.

If an outgoing international exchange has to set up a call/connection for which CDVT indication is to be supported, then the following shall apply:

- An outgoing international exchange may reduce the maximum backwards CDVT values in conformance with the maximum CDVT allowed by the NPC function.

c) *Parameters in the Set_Up, and Subsequent_Address Request primitives – Issued by the non-assigning exchange*

See 2.2.3.1 e).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.3.4 Actions required at an intermediate international exchange

2.2.3.4.1 Incoming side of the exchange

See 2.2.1.2.1.

2.2.3.4.2 Other actions at the exchange

a) *Virtual channel selection*

See 2.2.3.2.2 a).

b) *Parameters in the Set_Up, and Subsequent_Address request primitives – Issued by the assigning exchange*

See 2.2.3.1 d), with the following addition:

- The most significant digits in the called party number may be amended or omitted (country code is removed at the last exchange before the incoming international exchange).

c) *Parameters in the Set_Up, and Subsequent_Address request primitives – Issued by the non-assigning exchange*

See 2.2.3.1 e).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.3.5 Actions required at an incoming international exchange

2.2.3.5.1 Incoming side of the exchange

See 2.2.1.2.1.

2.2.3.5.2 Other actions at the exchange

a) *Virtual channel selection*

See 2.2.3.2.2 a).

b) *Parameters in the Set_Up, and Subsequent_Address request primitives – Issued by the assigning exchange*

See 2.2.3.1 d).

c) *Parameters in the Set_Up, and Subsequent_Address request primitives – Issued by the non-assigning exchange*

See 2.2.3.1 e).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.3.6 Actions required at the destination exchange

See 2.2.1.6.

2.2.3.7 Called party number for operator calls

See 2.2.1.7.

2.2.3.8 Called number for calls to testing and measuring devices

See 2.2.1.8.

2.2.4 Address_Complete request primitive

2.2.4.1 Actions required at the destination exchange

An Address_Complete request primitive will be sent from the destination exchange as soon as it has been determined that the complete called party number has been received, and to convey indications on the called party's status and on tones and announcements. The Called Line Status indicator will be set appropriately.

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

- called party's status: "No indication".

  In this case the indication that the destination user is being alerted is transferred in a Progress primitive (see 2.2.5).

b) The destination exchange concludes from the receipt of an indication from the ISDN access that the complete called party number has been received. In this case the indicators in the Address_Complete request primitive will be set as follows:

- called party's status: "alerting".

The Address Complete request primitive can transport unaltered information from the access to the origin in the following parameters: Narrow-band Bearer Capability, Narrow-band High Layer Compatibility, Notification Indicator, Report Type and Progress Indicator parameter.

The Address_Complete request primitive shall include the mandatory parameters listed in Table 2-3.

If an answer indication is received immediately from the called ISDN access, the Answer request primitive may be issued without having previously issued an Address_Complete request primitive.

2.2.4.2 Actions required at an intermediate national exchange

Upon receipt of an Address_Complete indication primitive an intermediate national exchange will issue the corresponding Address_Complete request primitive towards the preceding exchange.

If this is a national controlling exchange, the following is applicable in addition. If an Address Complete indication primitive is received the Await answer timer is started. If the Await Answer timer expires, the call/connection is released using cause #19 "No answer from user (user alerted)".

2.2.4.3 Actions required at an outgoing international exchange

See 2.2.4.2. Additional actions are:

- On receipt of the Address_Complete indication primitive, the Await Answer timer is started. If the Await Answer timer expires, the call and the connection are released, using cause #19 "No answer from user (user alerted)".

2.2.4.4 Actions required at an intermediate international exchange

See 2.2.4.2.

2.2.4.5 Actions required at an incoming international exchange

See 2.2.4.2.

2.2.4.6 Actions required at the originating exchange

a) On receipt of an Address_Complete indication primitive with the called party's status indicator set to "alerting", an alerting indication is passed to the calling party.

b) On receipt of the Address_Complete indication primitive the "Awaiting Answer" timer is started. If timer "Await Answer" expires, the connection is released (Cause #19 "No answer from user (user alerted)") and an indication is sent to the calling subscriber.

c) If the Address Complete indication primitive contains information from the access carried in the parameters mentioned in 2.2.4.1, it is transferred unaltered in the indication returned to the calling user.

2.2.4.7 Through connection and the awaiting answer indication at the destination exchange

The sending of the awaiting answer indication (e.g. in-band ring tone signal) at the destination exchange depends on the type of connection. For connections involving speech, 3.1 kHz audio and Unrestricted Digital Information with tones/announcements, as indicated in the Narrow-band Bearer Capability parameter, the awaiting answer indication is applied on the virtual connection to the calling party from the destination exchange. This indication is applied on receipt of an alerting indication from the called party or based on information contained within the destination exchange that the called party will not, or is prohibited from, providing an in-band ring tone signal. For other connection types, no awaiting answer indication is applied.

Regardless of whether tones are to be provided or not, the destination exchange will through connect after the reception of the connection indication from the called party and before issuing the Answer request primitive.

If the destination exchange does not send the awaiting answer indication because the destination user provides for the sending of in-band tone signals, then the destination exchange will through connect the transmission path in the backward direction on receipt of the progress indication.

The through connection of the virtual connection at answer, at other exchange types, is covered in 2.2.6.

2.2.4.8 Access delivery indication

In case the destination exchange delivered any call/connection setup information at the ISDN access, this will be indicated in the Access Delivery indicator in the first backward primitive, after the Incoming_Resources_Accepted request primitive.

Only the destination exchange can generate the Access Delivery indicator.

An intermediate exchange (e.g. an outgoing international exchange) is required to recognize the Access Delivery indicator when it is received, and pass it on.

When an intermediate exchange does not receive the Access Delivery indicator, no action is required.

2.2.5 Progress (basic call)

The Progress request primitive is sent only after the Address_Complete indication primitive. The Progress request primitive is sent from an exchange in the backward direction indicating that an event has occurred during call/connection setup which should be relayed to the calling party.

See also 2.3.6, Tones and Announcements.

2.2.5.1 Actions required at the destination exchange

The Progress request primitive is sent from the destination exchange if the Address_Complete request primitive has been sent and subsequently:

- An indication is received that the called party is being alerted. The Progress request primitive contains a Called Party's Indicators parameter with the Called Party's Status set to "alerting".
- A progress indication is received from the called party. This progress indication is transported unchanged in the Progress request primitive containing a Progress Indicator parameter.

The Progress request primitive shall include the mandatory parameters listed in Table 2-10.

The destination exchange may on receipt of the indication from the called party, that contains an appropriate Progress indicator, through connect the speech path, see 2.2.4.7.

The Progress request primitive can transport information from the access to the origin in the following parameters: Narrow-band Bearer Capability, Narrow-band High Layer Compatibility, Notification Indicator, Report Type, and Progress Indicator parameter.

2.2.5.2 Actions required at an intermediate exchange

On receipt of a Progress indication primitive, an intermediate exchange will issue the corresponding Progress request primitive.

2.2.5.3 Actions required at the originating exchange

On receipt of a Progress indication primitive at the originating exchange, no state change occurs, and the appropriate indication is sent to the calling user.

If the Progress indication primitive contains information from the access carried in the parameters mentioned in 2.2.5.1, it is transferred unaltered in the indication returned to the calling user.

2.2.6 Answer primitive

2.2.6.1 Actions required at the destination exchange

Option 1

When the called party answers, the destination exchange shall:

- allocate the requested quality of service;

  NOTE – A more detailed description has to be provided, for further study.
- remove ringing tone (if applicable);
- issue an Answer request primitive. The Answer request primitive shall include the mandatory parameters listed in Table 2-9.

If the exchange was requested to set up a call/connection in which the alternative ATM cell rate or the minimum ATM cell rate was included in the Set_Up indication primitive, then the following shall apply:

- If the answer message from the called party contains an indication of the final bandwidth used and if this indication is different from the already allocated bandwidth, the exchange shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported ATM cell rate. The answer request primitive shall contain the ATM cell rate parameter and, if applicable, additional ATM cell rate parameter.
- If the answer message from the called party does not contain an indication of the final bandwidth allocation, the exchange shall put the ATM cell rate parameter, and if applicable, the additional ATM cell rate parameter in the answer request primitive according to the bandwidth allocation used in that exchange.

If the exchange was requested to set up a call/connection for which ABR was indicated in the BroadBand Bearer Capability Parameter, then the following shall apply:

- If the answer indication from the called party indicates the finally negotiated parameters, the exchange will include the ATC setup parameters parameter, ATM cell rate parameter, and the additional ATM cell rate parameter in the answer request primitive. It shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported additional ATM cell rate parameter, if the cell rate already allocated is different.
- If the answer indication from the called party does not include the MCR finally allocated, the exchange shall put the additional ATM cell rate parameter in the answer request primitive according to the bandwidth already allocated in that exchange.

Through connection: see 2.2.4.7.

The Answer request primitive can be issued without having issued a previous Address_Complete request, e.g. in the case of an automatic answering terminal.

The Answer request primitive can transport information from the access to the origin in the following parameters: AAL Parameters, Narrow-band Bearer Capability, Narrow-band Low Layer Compatibility, Narrow-band High Layer Compatibility, Progress Indicator, Broadband Low Layer Information, Notification Indicator, Report Type, Report Type Prime, OAM Traffic Descriptor, and for frame relay connections: Link Layer Core Parameters, Link Layer Protocol Parameters.

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the following shall apply:

- Upon receipt of the answer indication primitive, the exchange shall determine the backward CDVT values which are applicable at the output port towards the preceding exchange based

on the backward CDVT values received from the called party. This may be achieved using resource management based calculations (see 2.1.3).

- The locally determined backward CDVT values shall be always lower than the values included in the Set_Up indication primitive, or by the calling party, otherwise the call shall be released with cause #37 "User cell rate not available".
- The locally determined backward CDVT values shall be included in the answer request primitive issued towards the preceding exchange.
- Backward resource allocation may be adjusted based on backward CDVT values for which it is the assigning exchange for.

Option 2

The procedures for Option 1 will be followed with the addition that the resource allocation/modification will be performed for both the assigning and non-assigning parts of the exchange.

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the following shall apply:

- Backwards resource allocation is adjusted based on the backwards CDVT values.
- If the resource allocation according to the received CDVT indication values is not possible, then the connection shall be released with cause #37 "User cell rate not available".

2.2.6.2 Actions required at an intermediate national exchange

Option 1

Upon receipt of an Answer indication primitive, the intermediate national exchange through connects the virtual connection in both directions if not already connected and issues the corresponding Answer request primitive towards the preceding exchange.

If an exchange was requested to set up a call/connection in which the alternative ATM cell rate or the minimum ATM cell rate was included in the Set_Up indication primitive, then the following shall apply:

- If the answer indication primitive contains the ATM cell rate parameter and, if applicable, the additional ATM cell rate parameter, the exchange shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported final bandwidth allocation, if the bandwidth previously allocated by the exchange is different. The answer request primitive shall contain the ATM cell rate parameter and, if applicable, the additional ATM cell rate parameter.
- If the answer indication primitive does not contain the ATM cell rate parameter, the exchange shall put the ATM cell rate parameter and, if applicable, the additional ATM cell rate parameter in the answer request primitive according to the bandwidth allocation used in that exchange.

If an exchange was requested to set up a call/connection for which ABR was indicated in the BroadBand Bearer Capability Parameter, the following shall apply:

- If the answer indication primitive contains the ATC setup parameters parameter, ATM cell rate parameter, and the additional ATM cell rate parameter, then the exchange will pass the parameters unchanged in the answer request primitive. It shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported additional ATM cell rate parameter, if the bandwidth already allocated is different.

- If the answer indication primitive received does not contain the additional ATM cell rate parameter, the exchange shall put the additional ATM cell rate parameter in the answer request primitive according to the bandwidth allocation used in the exchange.

If this is a national controlling exchange, and the Answer indication is received subsequent to an Address Complete indication, timer "Await Answer" is stopped.

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the procedures for CDVT indication in 2.2.6.1 shall apply.

Option 2

The procedures for Option 1 will be followed with the addition that the resource allocation/modification will be performed for both the assigning and non-assigning parts of the exchange.

2.2.6.3 Actions required at an outgoing international exchange

See 2.2.6.2. Additionally if the Answer indication is received subsequent to an Address Complete indication timer, "Await Answer" is stopped.

2.2.6.4 Actions required at an intermediate or incoming international exchange

See 2.2.6.2 with the following addition:

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the following shall apply:

- An incoming international exchange may release a call if backward CDVT values are not conforming to the maximum CDVT allowed by the NPC function, according to the procedures specified in 2.3.1 "Lack of resources at incoming side" with cause #37 "User cell rate not available".

2.2.6.5 Actions required at the originating exchange

Option 1

When the originating exchange receives an Answer indication primitive indicating the required call and connection have been completed, the "Awaiting Answer" timer is stopped, (if the Answer indication is received subsequent to an Address Complete indication). The virtual connection is connected through in both directions, if not already connected, and a connect indication is sent to the calling subscriber.

If the Answer indication primitive contains information from the access carried in the parameters mentioned in 2.2.6.1, it is transferred unaltered in the indication returned to the calling user.

If the exchange was requested to set up a call/connection in which the alternative ATM cell rate or the minimum ATM cell rate was included in the Set_Up indication primitive, then the following shall apply:

- If the answer indication primitive contains the ATM cell rate parameter and, if applicable, the additional ATM cell rate parameter, the exchange shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported final bandwidth allocation, if the bandwidth previously allocated by the exchange is different. The final bandwidth allocation is transferred in the indication returned to the calling user.
- If the answer indication primitive does not contain the ATM cell rate parameter, the exchange shall indicate the final bandwidth allocation used in that exchange in the indication returned to the calling user.

If an exchange was requested to set up a call/connection for which ABR was indicated in the BroadBand Bearer Capability Parameter, the following shall apply:

- If the answer indication primitive contains the ATC setup parameters parameter, ATM cell rate parameter, and the additional ATM cell rate parameter, then the exchange will map those parameters into the corresponding information elements in the CONNECT message. It shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported additional ATM cell rate parameter, if the bandwidth already allocated is different.
- If the answer indication primitive received does not contain the additional ATM cell rate parameter, the exchange shall indicate the final bandwidth allocation used in that exchange in the indication returned to the calling user.

If an exchange has to set up a call/connection for which CDVT indication is to be supported, then the procedures for CDVT indication in 2.2.6.1 shall apply.

Option 2

The procedures for Option 1 will be followed with the addition that the resource allocation/modification will be performed for both the assigning and non-assigning parts of the exchange.

2.2.7 Forward_Transfer primitive

Forward_Transfer may be sent in telephony semi-automatic working in either of the following two cases:

a) Following a call/connection switched automatically to a subscriber, or following a call/connection established via a special operator, the controlling operator wishes to call in a special assistance operator. On receipt of the Forward_Transfer indication primitive at the incoming international exchange, an assistance operator is called in.

b) Following a call via codes 11 and 12, the controlling operator wishes to recall the incoming international exchange. Receipt of the Forward_Transfer indication primitive at the incoming international exchange recalls the incoming operator on call/connections completed via the operator position at the exchange.

The support of Forward_Transfer at the international interface does not impose that the related functions are implemented in each incoming or outgoing international exchange (e.g. language assistance).

2.2.8 Transit network selection (national option)

If transit network selection information is included in the setup information from the calling party or is provided on a subscription basis, this information is carried in the Transit Network Selection parameter and is used for routing the call/connection, e.g. to a specific B-ISDN.

2.2.9 Storage and release of information

Each exchange of the connection shall store during the call/connection setup the information contained in the Set_Up primitive sent (originating exchange) or received (intermediate or destination exchange). The information to be stored includes all parameters in the Set_Up primitive.

The Set_Up primitive information can be released from memory:

a) in the originating or intermediate exchange, when the Address_Complete or Answer indication primitive has been received;

b) in the destination exchange, when the Address_Complete or Answer request primitive has been sent;

c) in all exchanges, when the call/connection is released earlier and no automatic repeat attempt is to be attempted.

2.2.10 Simple segmentation (national option)

In a national network where MTP-2 is used as the level 2 protocol, an exchange-provisionable indication will be provided, which can be applicable to an entire exchange, or to a grouping based on signalling relations. The Simple Segmentation procedure is invoked only when such an indication indicates that MTP-2 is used.

The Simple Segmentation procedure uses the Segment request/indication primitive to convey an additional segment of an overlength message. The Application Process is assumed to have access to an internal function that can determine the length of the message to be constructed at the SACF-NI interface. Any message that can contain the Segmentation Indication parameter can be segmented using this method. This procedure provides a mechanism for the transfer of certain messages whose contents are longer than 272 octets but not longer than 544 octets.

The procedure is as follows:

a) The sending exchange, on detecting that the message to be sent exceeds the 272-octet limit of the Message Transfer Part, can reduce the message length by sending some parameters in a Segment request primitive. The Segment request primitive is issued immediately following the receipt of the Incoming_Resources_Accepted indication primitive for the case of an overlength Initial Address message. In the case of other overlength messages, the Segment request primitive is issued immediately following the primitive containing the first segment.

b) The parameters that may be sent in the second segment using the Segment request primitive are parameters from the access (such as the high layer compatibility, low layer compatibility, and the progress indicator). If these parameters cannot be carried in the original message and altogether they do not fit in the segmentation message, parameters contained in the Segment request can be deleted.

c) The sending exchange sets the Segmentation Indicator in the segmentation indication parameter to indicate that additional information is available.

d) When a primitive is received, at a local exchange, with Segmentation Indicator set to indicate additional information is available, the exchange starts timer "Segmentation" to await the Segment indication primitive. This action may also take place at incoming or outgoing international exchanges if policing of information is required.

e) When Segment indication primitive is received timer "Segmentation" is stopped, and the call continues.

f) After expiry of timer "Segmentation", the call/connection shall proceed and any received segmentation message containing the second segment of a segmented message is discarded.

g) At an incoming or outgoing international exchange, when following the simple segmentation procedure, it is possible that the exchange has to reassemble an incoming message for onward transmission.

2.2.11 Connection_Available Request/Indication primitive

2.2.11.1 Action required at the originating exchange

On receipt of the end-to-end connection completion indication request from the calling party, the initiating exchange will issue a Connection_Available request primitive to the succeeding exchange.

2.2.11.2 Action required at an intermediate national exchange

On receipt of the Connection_Available indication primitive, an intermediate exchange will issue a Connection_Available request primitive to the succeeding exchange.

2.2.11.3 Action required at an outgoing international exchange

See 2.2.11.2.

2.2.11.4 Action required at an intermediate international exchange

See 2.2.11.2.

2.2.11.5 Action required at an incoming international exchange

See 2.2.11.2.

2.2.11.6 Action required at the destination exchange

On receipt of the Connection_Available indication primitive, the terminating exchange will proceed to confirm the end-to-end connection completion to the called party.

2.3 Unsuccessful call/connection setup

2.3.1 Lack of resources at the incoming side

If at any time a call/connection leg cannot be completed due to lack of resources at the incoming side (e.g. SIDs, VPCI/VCI or bandwidth), the exchange will immediately start the release of the call/connection and issue an Incoming_Resources_Rejected request primitive towards the preceding exchange. The Incoming_Resources_Rejected request primitive shall contain the mandatory parameters listed in Table 2-5. Cause #47 "resource unavailable, unspecified" is included, if no SIDs were available, cause #45 "No VPCI/VCI available" in case no VPCI/VCI is available, cause #37 "user cell rate not available" in the case of lack of bandwidth, cause #49 "Quality of service not available" in the case of the requested quality of service cannot be supported or if the maximum end-to-end transit delay is exceeded. The incoming signalling association (AEI) is deleted.

2.3.2 Lack of resources at the outgoing side

If at any time a call/connection leg cannot be completed due to lack of resources at the outgoing side (e.g. SIDs or bandwidth) or if the maximum end-to-end transit delay is exceeded, the exchange will immediately start the release of the call/connection and issue a Release request primitive towards the preceding exchange. The Release primitive shall contain the mandatory parameters listed in Table 2-7. Cause #47 "resource unavailable, unspecified" is included, if no SIDs were available, cause #45 "no VPCI/VCI available" in the case of lack of VPCI/VCI, cause #37 "user cell rate not available" in the case of lack of bandwidth or the CDVT requirements could not be met, cause #49 "Quality of service not available" in the case of the requested quality of service cannot be supported or if the maximum end-to-end transit delay is exceeded. Procedures continue as in 2.4.

2.3.3 Actions at an exchange receiving an Incoming_Resources_Rejected primitive

On receipt of an Incoming_Resources_Rejected indication primitive an exchange shall release the VPCI/VPI (if applicable) and the bandwidth, and shall terminate the outgoing signalling association, i.e. the associated AEI is deleted. The exchange may attempt to re-route the call/connection.

If all attempts to re-route the call/connection have failed the exchange shall:

a) Immediately start the release of the call/connection.

b) An intermediate exchange will issue a Release request primitive with the received cause towards the preceding exchange. Procedures continue as in 2.4.

c) An originating exchange will send an indication to the calling user.

2.3.4 Actions at an exchange receiving a Release message

On receipt of a Release indication primitive from the succeeding exchange after the Incoming_Resources_Accepted indication and before the Address_Complete indication the

exchange shall release the VPCI/VPI (if applicable) and the bandwidth, and shall issue a Release response primitive. The outgoing signalling association is terminated, i.e. the associated AEI is deleted:

a) If it is the controlling exchange (i.e. the exchange controlling the call), the exchange may attempt to re-route the call/connection.

b) If it is not the controlling exchange or if all attempts to re-route the call/connection have failed:

   1) An intermediate exchange will issue a Release request primitive with the received cause towards the preceding exchange. Procedures continue as in 2.4.3.

   2) An originating exchange will send an indication to the calling user.

2.3.5 Address Incomplete

The determination that the proper number of digits has not been received can be made at once if the end of pulsing signal is received.

When overlap working is used the "Address Incomplete" timer is started on receipt of the latest address message if the minimum or fixed number of digits for forward routing of the call/connection have not yet been received.

If the end of pulsing has not been received, the Release request primitive with cause #28 "address incomplete" will be sent towards the preceding exchange on expiry of the "Address Incomplete" timer. Procedures continue as in 2.4.

2.3.6 Tones and announcements

The applicability of tones and announcements is decided based on the narrow-band bearer capability. Tones and announcements are applicable for the following narrow-band bearer capabilities:

- Speech;
- 3.1 kHz audio; and
- Unrestricted Digital Information with tones/announcements.

If a call/connection setup fails and no in-band tone or announcement has to be returned to the calling party from an exchange succeeding the controlling exchange, a Release request primitive shall be issued in a backwards direction towards the controlling exchange. The cause should reflect the reason for the call/connection failure in the same way as the in-band tone or announcement to be applied by the controlling exchange.

If a call/connection setup fails and an in-band tone or announcement has to be returned to the calling party from an exchange, or called party, the exchange, or user, concerned connects the in-band tone or announcement to the transmission path. If a timeout occurs at the exchange providing the in-band tone or announcement, the exchange issues a Release request primitive towards the preceding exchange with cause #31 "normal, unspecified".

If an Address_Complete request primitive has already been issued, a Progress request primitive shall be issued towards the preceding exchange indicating that in-band information is available, along with the cause parameter. The cause should reflect the reason for call/connection failure in the same way as the in-band tone or announcement to be applied.

If an Address_Complete request primitive has not been issued already, an Address_Complete request primitive, with the cause parameter and the in-band information parameter, shall be issued towards the preceding exchange. The cause should reflect the reason for call/connection failure in the same way as the in-band tone or announcement to be applied.

In case a special tone or announcement has to be applied due to an event only known by a certain exchange and not covered by a cause, no cause is included in either the Address_Complete or Progress request primitives. The Answer request primitive must not be issued in this case.

For the preceding exchanges the inclusion of the cause parameter in the Address_Complete or Progress indication primitive implies an unsuccessful call/connection setup. For unsuccessful call/connection setups when interworking to Narrow-band ISDN has occurred, and the in-band tone or announcement is returned from an exchange beyond the Broadband/Narrow-band interworking point, the cause may not be included.

NOTE – The cause may not be included when in the narrow-band ISDN interworking to a PSTN has occurred and the in-band tone or announcement is returned from the exchange beyond the interworking point.

2.3.7 Unable to modify allocated bandwidth

If, during call/connect setup with negotiation, the exchange cannot modify the allocated bandwidth, the connection shall be released in both directions with cause #37 "User cell rate not available".

2.3.8 Invalid combination of traffic parameters and QoS class

If, during call/connection setup, the network receives and Set_Up request primitive with a valid combination of traffic parameters, but requests a QoS class which the network is unable to support, the Set_Up request primitive shall be rejected with cause #49 "Quality of service not available".

If, during call/connection setup, the network receives a Set_Up request primitive with a combination of traffic parameters and/or QoS class which is not a valid combination according to the ITU-T Q.2961.x-series Recmmendations or Annex A/Q.2965.1, the Set_Up request primitive shall be rejected with cause #73 "Unsupported combination of traffic parameters".

2.4 Normal call/connection Release

2.4.1 General

The release procedure is a confirmed operation; whereby the Release request/indication initiates release of the call and virtual channel connection, and the response/confirmation signifies completion of the release. The same procedures are used in the network irrespective whether they are initiated by the calling party, the called party or the network.

The following actions will be performed by any exchange receiving a Release indication primitive:

- the associated VPCI/VCI will be made available for new traffic;
- the bandwidth will be made available for new traffic;
- and after that the appropriate Release response primitive is returned;
- the signalling association is terminated, i.e. the associated AEI is deleted.

An exchange that has initiated the release procedure by issuing a Release request primitive shall perform the following actions on receipt of the Release confirmation primitive:

- the associated VPCI/VCI will be made available for new traffic;
- the bandwidth will be made available for new traffic;
- the signalling association is terminated, i.e. the associated AEI is deleted.

The following subclauses describe additional required actions.

2.4.2 Release initiated by a calling party

a) *Actions required at the originating exchange*

On receipt of a request to release the call/connection from the calling party, the originating exchange immediately starts the release of the ATM connection. A Release request primitive is issued towards the succeeding exchange.

In case of premature release by the calling party, the exchange shall immediately release the resources towards the calling party, but shall delay the release of the connection towards the succeeding exchange until receipt of the Incoming_Resources_Accepted indication primitive.

b) *Actions at an intermediate exchange*

On receipt of the Release indication primitive, an intermediate exchange will issue a Release request primitive towards the succeeding exchange. The release of the connection towards the succeeding exchange shall not occur until after the receipt of the Incoming_Resources_Accepted indication primitive.

c) *Actions required at the destination exchange*

The exchange shall immediately release the resources towards the called party.

d) *Collision of Release primitives*

In the case when two points in the connection initiate the release of the call/connection, a Release indication primitive may be received at an exchange from a succeeding or preceding exchange after the release of the call/connection is initiated. In this case, the exchange will return a Release response primitive towards the exchange from which the concerned Release request primitive was received. The Release response primitive will be issued, when the transmission path is disconnected.

The exchange will:

- make the associated VPCI/VCI available for new traffic;
- make the bandwidth available for new traffic;
- terminate the signalling association,

when both a Release confirmation primitive is received (corresponding to the sent Release request primitive) and a Release response primitive is sent (corresponding to the received Release request primitive).

2.4.3 Release initiated by a called party

The procedures in 2.4.2 apply, except that the functions at the originating and destination exchange are transposed.

2.4.4 Release initiated by the network

The procedures in 2.4.2 apply, except that they can be initiated at any exchange.

2.4.5 Pre-release information transport

This capability allows information to be transported at Release in a manner which is compatible with capability set 1 and subsequent versions of the B-ISUP protocol.

An exchange wishing to send additional parameters at release time may, depending on the application, include them instead of in a Release request primitive, within a Pre-Release_Info request primitive, which shall be sent immediately prior to the Release request primitive.

An exchange receiving a Pre-Release_Info indication primitive shall determine whether to store the received information and process it upon release of the call/connection or pass-on the Pre-Release request primitive without awaiting the Release indication primitive, depending on the parameters received and the application present for the call at that exchange.

2.5 Suspend, Resume (network initiated)

The Suspend and Resume (network initiated) procedures are only applicable in case of interworking with N-ISDN User Part. An interworking exchange is defined as the exchange performing

interworking between B-ISDN User Part and N-ISDN User Part (N-ISDN interworking exchange). Other interworking cases are not applicable.

2.5.1 Suspend (network initiated)

The Suspend primitive indicates a temporary cessation of communication without releasing the call/connection. It can only be accepted during the conversation/data phase.

a) *Action at an intermediate exchange*

On receipt of a Suspend indication primitive the exchange will send a Suspend request primitive towards the preceding exchange.

b) *Additional action at the controlling exchange (i.e. exchange controlling the call/connection)*

On receipt of a Suspend (network initiated) indication the controlling exchange starts timer "Await Network Resume" to ensure that a Resume (network initiated), or a Release indication is received. The value of timer "Await Network Resume" is covered in ITU-T Recommendation Q.118. If timer "Await Network Resume" expires, the procedures in 2.5.3 apply.

c) *Additional actions at an incoming international exchange*

On receipt of the Suspend (network initiated) indication, the incoming international exchange starts timer "Await Network Resume-International" to ensure that a Resume (network initiated), or a Release indication, is received. The value of this timer is covered in ITU-T Recommendation Q.118. If timer "Await Network Resume-International" expires, the procedure in 2.5.3 applies. The procedure described above may not be applied in the incoming international exchange if a similar arrangement is already made in the network of the incoming country.

2.5.2 Resume (network initiated)

A Resume primitive indicates a request to recommence communication. A request to release the call/connection received from the calling party will override the Suspend/Resume sequence and the procedures given in 2.4 will be followed.

a) *Actions at an intermediate exchange*

On receipt of a Resume indication primitive the exchange will send a Resume request primitive towards the preceding exchange.

b) *Additional actions at the controlling exchange (i.e. exchange controlling the call/connection)*

On receipt of a Release, or a Resume (network initiated) indication primitive the controlling exchange stops timer "Await Network Resume".

c) *Additional actions at an incoming international exchange*

On receipt of a Release, or a Resume (network initiated) indication from the succeeding exchange, the incoming international exchange stops the timer "Await Network Resume-International".

2.5.3 Expiration of timers "await network resume" and "await network resume-international"

If a Resume (network initiated) message is not received within timer "Await Network Resume" or timer "Await Network Resume-International" (both covered in ITU-T Recommendation Q.118), then the exchange where the timer has been started will initiate the release procedure on both sides. Cause #102 "recovery on timer expiry" is used in the Release request primitives.

2.6 Propagation delay determination

The procedure provides means to determine the total propagation delay for a connection.

A propagation delay value must be defined for each virtual path connection going out of every exchange, for which the exchange is the assigning exchange.

The propagation delay information is accumulated during call/connection setup in the forward direction. The result is sent in the backward direction as call history information before the active phase of a call/connection.

2.6.1 Procedure

The procedure starts from the principle that the propagation delay of a connection is detected during call/connection setup by increasing the propagation delay counter contained in the Set_Up request/indication primitive and that the accumulated result is sent in backward direction included in the Answer primitive.

2.6.1.1 Actions at the initiating exchange

The initiating exchange is the exchange which initiates the procedure, e.g. a typical case is the originating local exchange.

2.6.1.1.1 Actions referring to the propagation delay counter

In the case of an assigning exchange, the propagation delay counter shall be set to a value defined for the selected VPC to the succeeding exchange, plus an access delay value (if available).

In the case of a non-assigning exchange, the propagation delay counter shall be set to the access delay value, or zero if the access delay value is unknown.

2.6.1.1.2 Actions referring to the call history information

Upon receipt of the call history information parameter in the Answer indication primitive, the initiating exchange has to store the received delay value until the call/connection is released.

2.6.1.2 Actions at an intermediate exchange

An intermediate exchange can be a national transit exchange, an incoming or outgoing gateway exchange or an international transit exchange.

2.6.1.2.1 Actions referring to the propagation delay counter

a) *Incoming side of the exchange*

In the case of an assigning exchange, after choosing a virtual path connection the propagation delay counter shall be increased by the corresponding delay value.

In the case of a non-assigning exchange the propagation delay counter is unchanged.

b) *Outgoing side of the exchange*

In the case of an assigning exchange, after choosing a virtual path connection the propagation delay counter shall be increased by the corresponding delay value.

In the case of a non-assigning exchange the propagation delay counter is unchanged.

The Set_Up request primitive is issued towards the succeeding exchange containing the new value of the propagation delay counter.

2.6.1.2.2 Actions referring to the call history information

The intermediate exchange shall pass the call history information parameter in the Answer request primitive towards the preceding exchange.

2.6.1.3 Actions at the terminating exchange

The terminating exchange is the exchange which terminates the procedure, e.g. a typical case is the local destination exchange.

2.6.1.3.1 Actions referring to the propagation delay counter

a) *Incoming side of the exchange*

In the case of an assigning exchange, after choosing a virtual path connection the propagation delay counter shall be increased by the corresponding delay value.

b) *Other actions at the exchange*

The destination exchange shall increase the value by the delay value of the terminating access (if available) and store it until the call/connection is released.

2.6.1.3.2 Actions referring to the call history information

The value of the call history information parameter is set according to the stored value of the propagation delay counter.

The call history information parameter shall be included in the Answer request primitive.

2.7 Successful modification during active phase

2.7.1 Modify Request/Indication primitive

2.7.1.1 Actions at the originating exchange

Option 1

a) *Assigning exchange*

If neither the Minimum ATM Cell Rate parameter nor the Alternative ATM Cell Rate parameter are included in the request to modify the connection characteristics from the connection owner, the following shall apply:

- On receipt of a request to modify connection characteristics from the connection owner, the initiating exchange will reserve the corresponding resources on the outgoing side of the exchange and will issue a Modify request primitive to the succeeding exchange.
- Policing policy in forward direction shall be changed when decrease of any forward direction bandwidth is requested. The action of changing policing policy will be taken before issuing the Modify request primitive.

If the Minimum ATM Cell Rate parameter is included in the request to modify the connection characteristics from the connection owner, the following shall apply:

- If the exchange can support the requested connection characteristics, then it will reserve the corresponding resources on the outgoing side of the exchange and issue a Modify request primitive including the original requested connection characteristics, as well as the Minimum ATM Cell Rate parameter, to the succeeding exchange.
- Depending on routing conditions, the following applies:
  - If the exchange cannot support the requested connection characteristics, but can support a cell rate between the requested cell rate and the Minimum ATM Cell Rate, then the exchange will reserve the corresponding resources on the outgoing side of the exchange, insert this cell rate into the ATM Cell Rate parameter and additional ATM Cell Rate parameter (if applicable) and issue a Modify request primitive including the ATM Cell Rate, additional ATM Cell Rate (if applicable) and Minimum ATM Cell Rate parameters to the succeeding exchange.

– If the exchange can support only the Minimum ATM Cell Rate, then the exchange will reserve the corresponding resources on the outgoing side of the exchange, insert this value into the ATM Cell Rate parameter and additional ATM Cell Rate parameter (if applicable) and issue a Modify request primitive including the ATM Cell Rate and additional ATM Cell Rate (if applicable) parameter to the succeeding exchange.

– If the exchange cannot support the connection characteristics requested by the user, and also cannot support the Minimum ATM Cell Rate requested by the user, then the exchange will issue a Modify-Rejected request primitive, with cause #37 "User cell rate not available", towards the preceding exchange.

If the Alternative ATM Cell Rate parameter is included in the request to modify the connection characteristics from the connection owner, the following shall apply:

- If the exchange can support the requested connection characteristics, it will include the original requested connection characteristics, as well as the Alternative ATM Cell Rate parameter in the Modify request primitive. The exchange checks the Alternative ATM Cell Rate parameter to see if this can be supported by the allocated resources. If not, then the Alternative ATM Cell Rate parameter is discarded.
- Depending on routing conditions, the following applies:
  – If the exchange cannot support the requested connection characteristics, but can support the Alternative ATM Cell Rate, then the exchange will reserve the corresponding resources on the outgoing side of the exchange, insert this value into the ATM Cell Rate parameter and Additional ATM Cell Rate parameter (if applicable) in the Modify request primitive, discard the Alternative ATM Cell Rate parameter and issue a Modify request primitive.
  – If the exchange cannot support the connection characteristics requested by the user, and also cannot support the Alternative ATM Cell Rate requested by the user, then the exchange will issue a Modify_Rejected request primitive, with cause #37 "User cell rate not available", towards the preceding exchange.

b) *Non-assigning exchange*

The exchange passes the received Alternative ATM Cell Rate parameter, if present, or the Minimum ATM Cell Rate parameter, if present, in the Modify Request primitive.

Policing policy in forward direction shall be changed when decreased of any forward direction bandwidth is requested. The action of changing policing policy shall be taken before issuing the Modify request primitive.

Option 2

See the procedures under Option 1 for the assigning exchange.

2.7.1.2 Actions at an intermediate national exchange

On receipt of the Modify indication primitive, and intermediate national exchange will perform the following actions:

2.7.1.2.1 Incoming side of the exchange

Option 1

a) *Assigning exchange*

If neither the Minimum ATM Cell Rate parameter nor the Alternative ATM Cell Rate parameter are included in the Modify Request primitive the following shall apply:

- On receipt of the Modify indication primitive, an intermediate exchange will reserve the corresponding resources and will issue a Modify request primitive to the succeeding exchange.

If the Minimum ATM Cell Rate parameter is included in the Modify Request primitive the following shall apply:

- If the exchange can support the requested connection characteristics, then it will reserve the corresponding resources using normal procedures and issue a Modify request primitive to the succeeding exchange.
- If the exchange cannot support the requested connection characteristics, but can support a cell rate between the requested cell rate and the Minimum ATM Cell Rate, then the exchange will reserve the corresponding resources based on this cell rate and issue a Modify request primitive to the succeeding exchange. This cell rate is used as the ATM Cell Rate in subsequent processing, together with the Minimum ATM Cell Rate.
- If the exchange only supports the Minimum ATM Cell Rate, then the exchange will reserve the corresponding resources based on this cell rate and issue a Modify request primitive to the succeeding exchange. This cell rate is used as the ATM Cell Rate in subsequent processing, and the Minimum ATM Cell Rate parameter is not passed.
- If the exchange cannot support the connection characteristics requested by the user, and also cannot support the Minimum ATM Cell Rate requested by the user, then the exchange will issue a Modify_Rejected request primitive with cause #37 "User cell rate not available" towards the preceding exchange.

If the Alternative ATM Cell Rate parameter is included in the Modify Request primitive the following shall apply:

- If the exchange can support the requested connection characteristics, then it will reserve the corresponding resources using normal procedures. The exchange checks the Alternative ATM Cell Rate parameter to see if this can be supported by the allocated resources. If not, then the Alternative ATM Cell Rate parameter is discarded.
- If the exchange cannot support the requested connection characteristics, but can support the Alternative ATM Cell Rate parameter, then the exchange will reserve the corresponding resources. This bandwidth allocation is used in subsequent processing, and the Alternative ATM Cell Rate parameter is not passed.
- If the exchange cannot support the connection characteristics requested by the user, and also cannot support the Alternative ATM Cell Rate requested by the user, the exchange will issue a Modify_Rejected request primitive with cause #37 "User cell rate not available" towards the preceding exchange.

b) *Non-assigning exchange*

The exchange follows normal procedures.

Option 2

See the procedures under Option 1 for the assigning exchange.

2.7.1.2.2 Other actions at the exchange

a) *Assigning exchange*

See 2.7.1.1

b) *Non-assigning exchange*

See 2.7.1.1

2.7.1.3 Actions at an outgoing international exchange

See 2.7.1.2, with the following addition:

If policing is applied, policing policy in backward direction shall be changed when increase of any backward bandwidth is requested. The action of changing policing will be taken before issuing the Modify request primitive.

2.7.1.4 Actions at an intermediate international exchange

See 2.7.1.2, with the following addition:

If policing is applied, policing policy in forward direction shall be changed when decrease of any forward bandwidth is requested, and policing policy in backward direction shall be changed when increase of any backward bandwidth is requested. The action of changing policing will be taken before issuing the Modify request primitive.

2.7.1.5 Actions at an incoming international exchange

See 2.7.1.2, with the following addition:

If policing is applied, policing policy in forward direction shall be changed when decrease of any forward bandwidth is requested. The action of changing policing will be taken before issuing the Modify request primitive.

2.7.1.6 Actions at the terminating exchange

On receipt of the Modify indication primitive, the terminating exchange will reserve the corresponding resources as specified in 2.7.1.2.1 on the incoming side of the exchange (if it is the assigning exchange) and will proceed to request a modification to the non-connection owner.

2.7.2 Modify Response/Confirmation primitive

2.7.2.1 Actions at the terminating exchange

Option 1

If neither the Minimum ATM Cell Rate parameter nor the Alternative ATM Cell Rate parameter was included in the Modify Request primitive, the following shall apply:

- On receipt of the modification acknowledgment from the non-connection owner, the terminating exchange will allocate the resources (if it is the assigning exchange) and will issue a Modify response primitive to the preceding exchange.
- The policing in backward direction shall be changed if modification of any backward bandwidth is requested. The action of changing policing policy will be taken before Modify response primitive is issued.

If either the Minimum ATM Cell Rate parameter or the Alternative ATM Cell Rate parameter was included in the Modify Request primitive, the following shall apply:

- When the called party responds to the modification acknowledgement with an indication of the final bandwidth used, the exchange shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported ATM Cell Rate, if the bandwidth already allocated is different. Then the exchange will issue the Modify response primitive including the ATM Cell Rate parameter and, if applicable, the Additional ATM Cell Rate parameter to the preceding exchange.
- When the called party responds to the modification acknowledgement without the indication of the final bandwidth allocation, the exchange shall put the ATM Cell Rate parameter and, if applicable, the Additional ATM Cell Rate parameter in the Modify response primitive

according to the bandwidth allocation used in that exchange and issue the Modify response primitive to the preceding exchange.

- The policing in backward direction shall be changed if modification of any backward bandwidth is requested. The action of changing policing policy shall be taken before Modify response primitive is issued.

Option 2

The procedures for Option 1 will be followed with the addition that the resource allocation/modification will be performed for both the assigning and non-assigning parts of the exchange.

2.7.2.2 Actions at an intermediate national exchange

Option 1

If neither the Minimum ATM Cell Rate parameter nor the Alternative ATM Cell Rate parameter was included in the Modify Request primitive, the following shall apply:

- On receipt of the Modify confirmation primitive, an intermediate exchange will allocate the resources (if it is the assigning exchange for the incoming/outgoing VPCI) and will issue a Modify response primitive to the preceding exchange.

If either the Minimum ATM Cell Rate parameter or the Alternative ATM Cell Rate parameter was included in the Modify Request primitive, the following shall apply:

- Upon receipt of a Modify confirmation primitive with the ATM Cell Rate parameter and, if applicable, the Additional ATM Cell Rate parameter, the exchange shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported final bandwidth allocation, if the bandwidth previously allocated by the exchange is different. Then the exchange will issue the Modify response primitive including the ATM Cell Rate parameter and, if applicable, Additional ATM Cell Rate parameter to the preceding exchange.
- Upon receipt of a Modify confirmation primitive without the ATM Cell Rate parameter, the exchange shall put the ATM Cell Rate parameter and, if applicable, the Additional ATM Cell Rate parameter in the Modify response primitive according to the bandwidth allocation used in that exchange and issue the Modify response primitive to the preceding exchange.

Option 2

The procedures for Option 1 will be followed with the addition that the resource allocation/modification will be performed for both the assigning and non-assigning parts of the exchange.

2.7.2.3 Actions at an outgoing international exchange

See 2.7.2.2, with the following addition:

If policing is applied, policing policy in backward direction shall be changed when decrease of any backward bandwidth is requested. The action of changing policing will be taken before issuing the Modify response primitive.

2.7.2.4 Actions at an intermediate international exchange

See 2.7.2.2, with the following addition:

If policing is applied, policing policy in backward direction shall be changed when decrease of any backward bandwidth is requested, and policing policy in forward direction shall be changed when increase of forward bandwidth is requested. The action of changing policing will be taken before issuing the Modify response primitive.

2.7.2.5 Actions at an incoming international exchange

See 2.7.2.2, with the following addition:

If policing is applied, policing policy in forward direction shall be changed when increase of any forward bandwidth is requested. The action of changing policing will be taken before issuing the Modify response primitive.

2.7.2.6 Actions at the initiating exchange

Option 1

If neither the Minimum ATM Cell Rate parameter nor the Alternative ATM Cell Rate parameter was included in the request to modify the connection characteristics from the connection owner, the following shall apply:

- On receipt of the Modify confirmation primitive, the initiating exchange will allocate the resources (if it is the assigning exchange) and will proceed to indicate a modification acknowledgment to the connection owner. The policing in forward direction shall be changed when increase of forward bandwidth is requested.
- The action of changing policing policy will be taken before modification acknowledge is notified to the connection owner.

If either the Minimum ATM Cell Rate parameter or the Alternative ATM Cell Rate parameter was included in the request to modify the connection characteristics from the connection owner, the following shall apply:

- Upon receipt of a Modify confirmation primitive containing the ATM Cell Rate parameter and, if applicable, Additional ATM Cell Rate parameter, the exchange shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported ATM Cell Rate, if the bandwidth already allocated is different. The final bandwidth allocation is transferred in the indication returned to the calling user.
- Upon receipt of a Modify confirmation primitive without the ATM Cell Rate parameter, the exchange shall indicate the final bandwidth allocation used in that exchange in the indication returned to the calling user.
- The policing in forward direction shall be changed when increase of any forward bandwidth is requested. The action of changing policing policy shall be taken before modification acknowledge is notified to the connection owner.

Option 2

The procedures for Option 1 will be followed with the addition that the resource allocation/modification will be performed for both the assigning and non-assigning parts of the exchange.

2.7.3 Connection_Available Request/Indication primitive

2.7.3.1 Action required at the initiating exchange

On receipt of the modification confirmation request from the connection owner, the initiating exchange will issue a Connection_Available request primitive to the succeeding exchange.

2.7.3.2 Action required at an intermediate national exchange

On receipt of the Connection_Available indication primitive, an intermediate exchange will issue a Connection_Available request primitive to the succeeding exchange.

2.7.3.3 Action required at an outgoing international exchange

See 2.7.3.2.

2.7.3.4 Action required at an intermediate international exchange

See 2.7.3.2.

2.7.3.5 Action required at an incoming international exchange

See 2.7.3.2.

2.7.3.6 Action required at the terminating exchange

On receipt of the Connection_Available indication primitive, the terminating exchange will proceed to confirm the modification to the non-connection owner.

2.8 Unsuccessful modification during active phase

2.8.1 Lack of resources

Option 1

If a modification cannot be completed due to lack of resources, the exchange will immediately issue a Modify_Rejected request primitive towards the preceding exchange. This procedure applies to an assigning exchange only. The Modify_Rejected primitive shall contain the mandatory parameters listed in Table 2-17. Cause #37 "User cell rate not available" is included in the case of lack of bandwidth.

If the exchange cannot modify the allocated bandwidth (u-Plane), the connection shall be released in both directions with cause #37 "User cell rate not available".

Option 2

If a modification cannot be completed due to lack of resources, the exchange will immediately issue a Modify_Rejected request primitive towards the preceding exchange. The Modify_Rejected primitive shall contain the mandatory parameters listed in Table 2-17. Cause #37 "User cell rate not available" is included in the case of lack of bandwidth.

If the exchange cannot modify the allocated bandwidth (u-Plane), the connection shall be released in both directions with cause #37 "User cell rate not available".

2.8.2 Actions at an exchange receiving a Modify_Rejected primitive

Option 1

On receipt of a Modify_Rejected indication primitive, an exchange shall cancel the reservation of resources (if it is the assigning exchange) and reinstate the policing policy that applied before the modify requesting, and:

1) An intermediate exchange will issue a Modify_Rejected request primitive to the preceding exchange.
2) The initiating exchange will send an indication to the connection owner.

Option 2

On receipt of a Modify_Rejected indication primitive, an exchange shall cancel the reservation of resources and reinstate the policing policy that applied before the modify requesting, and:

1) An intermediate exchange will issue a Modify_Rejected request primitive to the preceding exchange.
2) The initiating exchange will send an indication to the connection owner.

2.8.3 Actions at an exchange receiving a release primitive after sending Modify Request primitive

On receipt of a Release indication primitive after sending the Modify request, the exchange will continue with normal connection release procedures.

2.8.4 Actions at an exchange receiving a confusion primitive

On receipt of a Confusion indication primitive, if the cause indicators parameter implies that a Modify Request message was discarded, the exchange shall issue a Modify_Rejected request primitive to the preceding exchange.

2.9 Interworking with nodes not supporting the capabilities included in this ITU-T Recommendation

2.9.1 Negotiation procedures

Such nodes will treat the alternative ATM cell rate or minimum ATM cell rate parameters as unrecognized signalling information. The instruction indicators for these parameters will be set so as to discard these parameters at the CS-1 node and continue processing based on the ATM cell rate parameter and (if applicable) additional ATM cell rate only.

2.9.2 Modification procedures

When such nodes receive a Modify indication primitive, the nodes will discard the primitive and return a Confusion primitive toward the preceding node following the instruction indicators. The coding of the message compatibility information for the Modify request primitive and the Modify response primitive is shown in Appendix II. The node receiving this confusion primitive follows 2.8.4.

If such nodes understand the Modify indication primitive, but do not understand the additional ATM cell rate parameter, the node will treat the additional ATM cell rate parameter as an unrecognized signalling information. The instruction indicators for this parameter will be set so as to cause the discard of the modify request message and the sending of a confusion message. Hence when such nodes receive a modify indication primitive with an additional ATM cell rate parameter, the nodes will discard the primitive and return a confusion primitive towards the proceeding node following the instruction indicators. The node receiving this confusion primitive follows 2.8.4.

2.9.3 Interworking with exchanges not supporting the requested ATM traffic capabilities

The BroadBand Bearer Capability parameter is relevant to routing, an exchange not supporting a traffic capability indicated by the BroadBand Bearer Capability parameter shall not be routed to unless an error in routing has occurred. In these cases the following applies:

Nodes not supporting the traffic capability do not support the parameter values indicating the traffic capability and the procedure shall apply as for the receipt of unrecognized signalling information. The instruction indicators for these parameters shall be set so as to release the call/connection.

NOTE – Instruction indicators for the BroadBand Bearer Capability parameter should be set as shown in Appendix II in order to support the correct behaviour.

As there is not a one-to-one correspondence between the codepoints of the BTC field and the ATCs as defined in I.371, nor an I.356 equivalent QoS class when the value 0 is used, networks conforming to ITU-T Recommendations I.371 and I.356 receiving an IAM coded according to Table A.1/Q.2961.2 or Annex A/Q.2965.1 may not support some combinations of bearer class, broadband transfer capability as indicated in the B-BC parameter, and the ATM traffic parameters as indicated in the ATM cell rate and/or additional ATM cell rate parameters, or may have to derive ATCs and QoS classes as indicated in ITU-T Q.2961.2.

2.9.4 Frame relay

The BroadBand Bearer Capability parameter is relevant to routing, an exchange not supporting a traffic capability indicated by the BroadBand Bearer Capability parameter shall not be routed to unless an error in routing has occurred. In these cases the following applies:

Such nodes do not support the Broadband Bearer Capability parameter as defined for Frame Relay will treat it as unrecognized signalling information. The instruction indicators for the Broadband bearer capability parameter shall be set so as to release the call/connection.

Such nodes do not support the link layer core parameters parameter and link layer protocol parameters parameter and will treat them as unrecognized signalling information. The instruction indicators for the link layer core parameters parameter and link layer protocol parameters parameter shall be set so as to pass them on when interworking with such nodes.

The instruction indicators are set as in Appendix II.

2.9.5 Cell delay variation tolerance indication

The CDVT parameter shall be discarded at such nodes.

The instruction indicators should be set as shown in Appendix II to support the correct behaviour.

2.9.6 Negotiation of AAL type parameter

Nodes which do not support the negotiation of AAL prime parameters parameter will treat the AAL prime parameters parameter as unrecognized signalling information.

The instruction indicators for AAL prime parameters parameter should be set to pass on in intermediate nodes, and be removed at terminating nodes not understanding this capability. The instruction indicators should be set as shown in Appendix II.

2.9.7 Individual QoS parameters

Nodes which do not support the Extended Quality of Service parameter and the End-to-end Transit Delay Network Generated Indicator will treat these parameters as unrecognized signalling information.

The instruction indicators for the Extended Quality of Service parameter shall be set so as to cause the call to be processed by an exchange not supporting this parameter. The Extended Quality of Service parameter shall be discarded at an intermediate exchange not supporting this parameter. However, as a network option, the Extended Quality of Service parameter may be passed.

The instruction indicators for the End-to-end Transit Delay Network Generated Indicator parameter shall be set so as to cause the call to be processed by an intermediate exchange not supporting this parameter. The End-to-end Transit Delay Network Generated Indicator parameter shall be passed on transparently at such nodes if it is an intermediate exchange, and the parameter shall be discarded, if such a node is a destination local exchange.

The instruction indicators should be set as shown in Appendix II.

2.9.8 Explicit QoS parameter

The originating exchange shall compare the explicit QoS class with the implicit QoS class. If the explicit QoS class is equal to the implicit QoS class, then the instruction indicators for the QoS parameter shall be set to pass on, otherwise the instruction indicator shall be set to release the call at an exchange which does not understand the QoS parameter.

If the explicit QoS class is "unspecified", the instruction indicators shall be set to pass on.

2.10 Error indication primitive

The Error indication primitive can be received as a result of various protocol errors detected by the ASEs. The following errors and their corresponding actions are identified:

a) Timer "Await Address Complete" expiry, detected by CC ASE – If this error occurs, the call/connection should be released, in both the forward and backward directions, using Cause #28 "Address incomplete".

b) Unexpected message received while awaiting the IAM Acknowledge message, detected by BCC ASE – This will initiate an automatic repeat attempt. The existing outgoing signalling association is terminated, i.e. the associated AEI is deleted *(Reset initiated by the Maintenance Application Process)*.

c) Unexpected message received while awaiting the Address Complete message, detected by CC ASE – This will initiate an automatic repeat attempt. The existing outgoing signalling association is terminated, i.e. the associated AEI is deleted *(Reset initiated by the Maintenance Application Process)*.

d) Timer "Await Release Complete" expiry, detected by BCC ASE – If this error occurs, the VPCI/VCI and the bandwidth shall be removed from service, and the signalling association is terminated, i.e. the associated AEI is deleted *(Reset initiated by the Maintenance Application Process)*.

e) Timer "Await IAM Acknowledge" expiry, detected by BCC ASE – If this error occurs, the VPCI/VCI and the bandwidth shall be removed from service, and the signalling association is terminated, i.e. the associated AEI is deleted *(Reset initiated by the Maintenance Application Process)*.

f) Unexpected Release Complete message received after the reception, or sending, of the IAM Acknowledge message, detected by BCC ASE – This will initiate the release of the call/connection, using cause #111 "protocol error, unspecified".

g) Timer "Await Modify Acknowledge" expiry, detected by BCC ASE – If this error occurs, the connection will be released.

h) Unexpected MOD message received while awaiting the Address Complete request of the Answer request, detected by CC ASE: if this error occurs the VPI/VCI and bandwidth shall be removed from service, and the signalling association is terminated, i.e. the associated AEI is deleted (Reset initiated by the Maintenance Application Process).

i) Unexpected message received relating to an unallocated SID, detected by BCC ASE – The signalling association is terminated, i.e. the associated AEI is deleted (Reset initiated by the Maintenance Application Process).

If an Error indication primitive is received indicating that any other error has occurred, it is discarded, with no action.

2.11 Support for Temporary Alternative Routing (TAR)

As described in 3.2.3/E.412, an exchange which has invoked the network management Temporary Alternative Routing (TAR) control shall include a "TAR controlled call" indication in a Set_Up request primitive.

A succeeding exchange which receives a TAR indicator indicating "TAR controlled call" in the network management controls parameter shall not apply network management Temporary Alternative routing (TAR) to the same call. The received TAR indicator shall be passed on unchanged.

2.12 Hop counter procedure

The B-ISUP hop counter procedure is used to detect call setup looping that can be caused by incorrect routing data. Incorrect routing data may be introduced when circuit (trunk) provisioning information between exchanges changes, especially when new circuits are added. The problem is temporary and can be corrected by correcting the route data. As such, the B-ISUP hop counter procedure is optional and can be deactivated when determined to be no longer needed. An exchange provisionable option to deactivate the hop counter procedure applies per outgoing SS7 trunk group (in terms of this procedure, and SS7 trunk group includes all SS7 VCs or VPs between two exchanges). The default is active.

2.12.1 Actions at the initiating exchange

An originating exchange or an intermediate exchange shall originate the hop counter procedure if the hop counter capability is activated. The Set_Up Request primitive shall include the hop counter parameter containing the initial count value.

The initial count value shall be provisionable by the network operator on a per exchange basis (31 maximum).

An originating exchange receiving a Release indication primitive with cause #25 "Exchange – routing error" shall notify the management system of the exchange routing error and provide the called party number, identity of the succeeding exchange (via OPC and CEI or ECEI), and if available, the calling party number or AESA for calling party number parameter.

2.12.2 Actions at an intermediate exchange

Intermediate exchanges, i.e. transit, gateway or interworking exchanges, actions are dependent upon whether a hop counter parameter is received from the preceding exchange and, if received, the result of decrementing the hop counter value.

If the hop counter parameter is received, the intermediate exchange shall decrement the hop counter value by 1. Subsequent actions are based on the result as described below:

a) If the result equals 0, the exchange shall release the call by returning a Release request primitive with cause #25 "Exchange – routing error", to the preceding exchange. In addition, the management system shall be informed of the hop counter exhaust (value = 0), associated called party number or AESA for called party number, identity of the preceding exchange (via OPC and CEI or ECEI), and if available, the calling party number or AESA for calling party number.

b) If the result is greater than 0, the exchange shall include the hop counter parameter in the Set_Up request primitive.

2.12.3 Actions at the destination local exchange

None. The exchange shall ignore the hop counter if received.

2.13 Automatic re-routing (Crankback)

The automatic re-routing (Crankback) procedure allows the call setup to return to a preceding exchange so that the call can be automatically re-routed from there. Crankback is an optional procedure which is applicable in networks provided with Automatic Re-routing (ARR) capability (refer to ITU-T Recommendation E.170). This procedure is an additional procedure to the unsuccessful call/connection setup procedures described in 2.3. The number of attempts to re-route a call/connection may optionally be controlled and limited. This limit is network specific. A call/connection may be automatically re-routed if the call cannot be routed further and the limit to re-route the call/connection has not been exceeded.

NOTE – Automatic re-routing may be invoked, e.g. due to one of the following release causes:

#2 – No route to specified transit network.

#3 – No route to destination.

#25 – Exchange routing error (if circular routing loop is detected).

#35 – Requested VPCI/VCI not available.

#37 – User cell rate not available (in the intermediate exchange).

#38 – Network out of order.

#41 – Temporary failure.

#45 – No VPCI/VCI available.

#47 – Resource unavailable, unspecified.

#49 – Quality of Service not available.

#57 – Bearer capability not authorized.

#58 – Bearer capability not presently available.

#63 – Service or option not available, unspecified.

#65 – Bearer capability not implemented.

#73 – unsupported combination of traffic parameters.

2.13.1 Actions at the intermediate exchange

2.13.1.1 Invocation of Automatic Re-routing

When a call/connection cannot be routed further due to a release cause, then Automatic Re-routing may be invoked and if:

a) the Automatic re-routing parameter has not been received with the Setup indication primitive, the intermediate exchange may invoke the Automatic Re-routing procedure by issuing a Release request primitive towards the preceding exchange including the Automatic re-routing parameter with the re-routing indicator coded as “do crankback” and, optionally, the re-routing counter set to "one";

b) the Automatic re-routing parameter has been received with the Setup indication primitive, the intermediate exchange may invoke the Automatic Re-routing procedure again by issuing a Release request primitive towards the preceding exchange including the Automatic Re-routing parameter with the re-routing indicator coded as “do crankback” and, optionally, the re-routing counter incremented by one.

When a call/connection cannot be routed further and Automatic Re-routing shall not be invoked, or the range of the re-routing counter is exceeded (received value equals 63), the intermediate exchange may issue a Release request primitive towards the preceding exchange including the Automatic re-routing parameter with the re-routing indicator set to "do not crankback".

2.13.1.2 Receiving a Release indication primitive with Automatic re-routing parameter

When the intermediate exchange receives a Release indication primitive from the succeeding exchange with the Automatic re-routing parameter indicating crankback (re-routing indicator coded as “do crankback”) and the maximum number of re-routing attempts has not been exceeded, the exchange may attempt to re-route the call automatically to an alternative route. If an alternate route is available, the exchange may optionally include the Automatic re-routing parameter into the Setup request primitive issued, to indicate how many automatic re-routing (crankback) attempts have occurred. The re-routing indicator is coded as “no indication”. If no alternative route is available, the received Release request primitive shall be passed towards the preceding exchange.

NOTE – The maximum number of re-routing attempts is network specific.

When the intermediate exchange receives a Release indication primitive from the succeeding exchange with the Automatic re-routing parameter indicating no crankback (re-routing indicator coded as "do not crankback"), the received Release indication primitive shall be passed towards the preceding exchange.

2.13.2 Actions at the originating local exchange

The originating local exchange performs the same actions as described in 2.13.1.2 with the exception, that the call/connection is released according to the normal release procedures if no alternate route is available or "do not crankback" is indicated within the re-routing indicator field.

2.13.3 Actions at the destination local exchange

When a call/connection cannot be established towards a user due to one of the release causes above and it is known from the local database that the user is connected to at least one other exchange over a physically separate link and alternative routing cannot be applied or is not successful, the destination local exchange performs the same actions as described in 2.13.1.1. Otherwise, if alternative routing is not successfully performed, the destination local exchange shall not invoke the Automatic Re-routing procedure and issue the Release request primitive towards the preceding exchange including the Automatic re-routing parameter with the re-routing indicator coded as "do not crankback".

2.14 Procedures for individual QoS parameters

2.14.1 Cumulative Cell Delay Variation

The cumulative forward and backward peak-to-peak Cell Delay Variation is accumulated during the call/connection setup in the forward direction, and the result is sent in the backward direction before the active phase of the call/connection.

The procedure is that the cumulative CDV contained in the Setup request/indication primitive is accumulated and that the accumulated result is included in the backward direction in the Answer indication primitive.

The allowable combinations of requested QoS classes and CDV information field is provided in Table D.1/I.356.

The rules for populating CDV information fields are provided in Table D.2/I.356.

2.14.1.1 Actions at the initiating exchange

Option 1

The cumulative Forward/Backward Cell Delay Variation shall be accumulated with the corresponding CDV values for the parts of the exchange which the exchange is acting as an assigning exchange. If the cumulative peak-to-peak cell delay variation value exceeds the acceptable peak-to-peak cell delay variation, the call/connection shall be rejected with cause #49, "Quality of Service not available".

The Set_Up request primitive issued to the succeeding exchange contains the new value of the Cumulative Forward/Backward Cell Delay Variation.

Option 2

The cumulative forward peak-to-peak cell delay variation value shall be accumulated at the outgoing side of the exchange with the expected increase due to user data transfer in forward direction within the exchange over the link.

If the cumulative peak-to-peak cell delay variation value exceeds the acceptable peak-to-peak cell delay variation, the call/connection shall be rejected with cause #49, "Quality of Service not available".

2.14.1.2 Actions at an intermediate exchange

Option 1

See 2.14.1.1.

Option 2

The cumulative backward peak-to-peak cell delay variation value shall be accumulated at the incoming side of the exchange with the expected increase due to user data transfer in backward direction within the exchange and over this link.

The cumulative forward peak-to-peak cell delay variation value shall be accumulated at the outgoing side of the exchange with the expected increase due to user data transfer in forward direction within the exchange over the link.

If the cumulative peak-to-peak cell delay variation value exceeds the acceptable peak-to-peak cell delay variation, the call/connection shall be rejected with cause #49, "Quality of Service not available".

2.14.1.3 Actions at the terminating exchange

Option 1

See 2.14.1.1.

Option 2

The cumulative backward peak-to-peak cell delay variation value shall be accumulated at the incoming side of the exchange with the expected increase due to user data transfer in backward direction within the exchange and over this link.

2.14.2 End-to-end transit delay network generated indicator

2.14.2.1 Actions at the originating exchange

When sending the Propagation delay parameter, the end-to-end transit delay network generated indicator shall be included when the individual quality of services are supported.

When the origin of the end-to-end transit delay was at user, the End-to-end transit delay network generated indicator shall be set to "User generated". When the origin of the end-to-end transit delay parameter was at the network, the End-to-end transit delay network generated indicator shall be set to "Network generated".

2.14.2.2 Actions at an intermediate exchange

When receiving the end-to-end transit delay network generated indicator from the preceding exchange, it will be passed on to the succeeding exchange.

2.14.2.3 Actions at the terminating exchange

When receiving the end-to-end transit delay network generated indicator from the preceding exchange, it may be passed on.

NOTE – See ITU-T Recommendation Q.2965.2.

2.14.3 Cell Loss Ratio (CLR)

As there is no cumulative field for CLR, no accumulation is necessary for the acceptable forward/backward CLR field.

2.15 Primitive contents

Tables 2-2 to 2-18 list the mandatory and optional contents for the SACF Call Control service primitives for the setup and release of basic call/connections.

Mandatory/Optional (M/O) indications are provided for both B-ISDN specific services, and N-ISDN emulation service. (For the tables where no difference is applicable between these two services, only one M/O column is provided.)

Parameters and messages which are only transported by the B-ISDN network in the case of N-ISDN interconnection are not shown in the following tables and are always optional.

For primitives generated by the Application Process, these tables indicate which parameters must be generated.

For primitives received by the Application Process – If the primitive does not contain a parameter indicated as Mandatory, the primitive is discarded and Maintenance Application Process is notified of the error *(Reset initiated by the Maintenance Application Process)*.

Table 2-2/Q.2764 – Parameters for Set_Up Request/Indication primitive

Set_Up Request/Indication		
Parameter	**B-ISDN**	**N-ISDN**
Message compatibility information	M	M
Additional ATM cell rate	O	–
Alternative ATM cell rate	O (Note 3)	–
AAL parameters	O	O
AAL prime parameters	O	O
ATC setup parameters	O	–
AESA for called party	O	O
ATM cell rate	M	M
Automatic Re-routing	O	O
Broadband bearer capability	M	M
Broadband low layer information	O	–
Broadband high layer information	O	–
Called party number	M	M

Table 2-2/Q.2764 – Parameters for Set_Up Request/Indication primitive *(concluded)*

Set_Up Request/Indication		
Parameter	**B-ISDN**	**N-ISDN**
Calling party's category	M	M
CDVT	O	O
Connection element identifier	O	O
Echo control information	O	O
End-to-end transit delay network generated indicator	O	O
Exclusive connection element identifier	O	O
Extended Quality of Service	O	O
Forward narrow-band interworking indicator	–	O
Hop Counter	O	O
Link layer core parameters	O	–
Link layer protocol parameters	O	–
Location number	O	O
Maximum end-to-end transit delay	O	O
Minimum ATM cell rate	O (Note 3)	–
Narrow-band bearer capability	–	M
Narrow-band high layer compatibility	–	O
Narrow-band low layer compatibility	–	O
National/international call indicator	O	O
OAM traffic descriptor	O	O
Origination ISC point code	O (Note 2)	O (Note 2)
Progress indicator	O	O
Propagation delay counter	M	M
Quality of service	O	O
Report Type	O	–
Report Type Prime	O	–
Segmentation indicator	O (National use)	O (National use)
Temporary Alternative Routing	O	O
Transit network selection	O (National use)	O (National use)
Exchange type (Note 1)	M	M

NOTE 1 – The exchange type parameter takes the appropriate value from the list in 1.1. It is passed to the AE so that the protocol can be varied depending on the role that the exchange is performing for this call/connection. Unlike the other parameters, it does not relate to a protocol information element. This parameter is only present in the request primitive.

NOTE 2 – This parameter is Mandatory when the Set_Up Request is issued at an outgoing international exchange.

NOTE 3 – Either the alternative ATM cell rate parameter or the minimum ATM cell rate parameter is included depending upon the specific procedure.

Table 2-3/Q.2764 – Parameters for Address_Complete Request/Indication primitive

Address_Complete Request/Indication		
Parameter	**B-ISDN**	**N-ISDN**
Message Compatibility Information	M	M
Access Delivery	O	O
Backward Narrow-band Interworking Indicator	–	O
Called Party's Indicators	M	M
Cause Indicators	O	O
Charge Indicator	O	O
Echo Control Information	O	O
In-Band Information Indicator	–	O
Narrow-band Bearer Capability	–	O
Narrow-band High Layer Capability	–	O
Progress Indicator	O	O
Report Type	O	–
Segmentation Indicator	O (National use)	O (National use)

Table 2-4/Q.2764 – Parameters for Incoming_Resources_Accepted Request/Indication primitive

Incoming_Resources_Accepted Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Connection Element Identifier	O

Table 2-5/Q.2764 – Parameters for Incoming_Resources_Rejected Request/Indication primitive

Incoming_Resources_Rejected Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Automatic Congestion Level	O
Cause Indicators	M

Table 2-6/Q.2764 – Parameters for Subsequent_Address Request/Indication primitive

Subsequent_Address Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Subsequent Number	M

Table 2-7/Q.2764 – Parameters for Release Request/Indication primitive

Release Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Access Delivery	O
Automatic Congestion Level	O
Automatic Re-routing	O
Cause Indicators	M
Progress Indicator	O
Segmentation Indicator	O (National use)

Table 2-8/Q.2764 – Parameters for Release Response/Confirmation primitive

Release Response/Confirmation	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Cause Indicator	O

Table 2-9/Q.2764 – Parameters for Answer Request/Indication primitive

Answer Request/Indication		
Parameter	**B-ISDN**	**N-ISDN**
Message Compatibility Information	M	M
Access Delivery	O	O
Additional ATM cell rate	O	–
AAL Parameters	O	O
ATC setup parameters	O	–
ATM cell rate	O	–
Backward Narrow-band Interworking Indicator	–	O
Broadband Low Layer Information	O	–
Call History Information	O	O
Called party's indicators	O	O
CDVT	O	O
Charge Indicator	O	O
Extended Quality of Service	O	O
In-Band Information Indicator	–	O
Link layer core parameters	O	–
Link layer protocol parameters	O	–
Narrow-band Bearer Capability	–	O
Narrow-band High Layer Capability	–	O

Table 2-9/Q.2764 – Parameters for Answer Request/Indication primitive *(concluded)*

Answer Request/Indication		
Parameter	**B-ISDN**	**N-ISDN**
Narrow-band Low Layer Capability	–	O
OAM Traffic Descriptor	O	O
Progress Indicator	O	O
Report Type	O	–
Report Type Prime	O	–
Segmentation Indicator	O (National use)	O (National use)

Table 2-10/Q.2764 – Parameters for Progress Request/Indication primitive

Progress Request/Indication		
Parameter	**B-ISDN**	**N-ISDN**
Message Compatibility Information	M	M
Access Delivery	O	O
Backward Narrow-band Interworking Indicator	–	O
Called Party's Indicators	O	O
Cause Indicators	O	O
Charge Indicator	O	O
In-Band Information Indicator	–	O
Narrow-band Bearer Capability	–	O
Narrow-band High Layer Capability	–	O
Progress Indicator	O	O
Report Type	O	–
Segmentation Indicator	O (National use)	O (National use)

Table 2-11/Q.2764 – Parameters for Suspend Request/Indication and Resume Request/Indication primitives

Suspend Request/Indication and Resume Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Suspend/Resume Indicators	M

Table 2-12/Q.2764 – Parameters for Forward_Transfer Request/Indication primitive

Forward_Transfer Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M

Table 2-13/Q.2764 – Parameters for Network_Resource_Management Request/Indication primitive

Network_Resource_Management Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Echo Control Information	O

Table 2-14/Q.2764 – Parameters for Segment Request/Indication primitive

Segment Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Broadband High Layer Information	O
Broadband Low Layer Information	O
Narrow-band High Layer Compatibility	O
Narrow-band Low Layer Compatibility	O
Progress Indicator	O

Table 2-15/Q.2764 – Parameters for Modify Request/Indication primitive

Modify Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
ATM Cell Rate	O (Note 1)
Additional ATM cell Rate	O (Note 1)
Alternative ATM Cell Rate	O (Note 2)
Minimum ATM Cell Rate	O (Note 2)
Notification	O
Exchange type (Note 3)	M

NOTE 1 – Both of these parameters are optional but at least one must be present.

NOTE 2 – When support the Modification Procedures with Negotiation, either the Alternative ATM Cell Rate parameter or the Minimum ATM Cell Rate parameter is included depending on the specific procedure.

NOTE 3 – The exchange type parameter takes the appropriate value from the list in 1.1. It is passed to the AE so that the protocol can be varied depending on the role that the exchange is performing for this call/connection. Unlike the other parameters it does not relate to a protocol information element. This parameter is only present in the request primitive.

Table 2-16/Q.2764 – Parameters for Modify Response/Confirmation primitive

Modify Response/Confirmation	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Report type	O
Notification	O

Table 2-17/Q.2764 – Parameters for Modify_Rejected Request/Indication primitive

Modify_Rejected Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Cause Indicators	M
Notification	O

Table 2-18/Q.2764 – Parameters for Connection_Available Request/Indication primitive

Connection_Available Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Notification	O
Report Type	O
NOTE – The former name of the primitive Connection Available was Modify_Confirm. Existing procedures are not influenced by this editorial change. However, this primitive may be used in additional procedure(s).	

Table 2-19/Q.2764 – Parameters for Pre-Release_Info Request/Indication primitive

Pre-Release_Info Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M

2.16 Modification rules for adjustment of ABR traffic capability during call/connection setup

See Table 2-20.

Table 2-20/Q.2764 – Allowed modifications for ABR ATM traffic capability during connection setup

Parameter for a given direction	Modification by the network
PCR	Decrease only, MCR ≤ PCR (Note 3)
ICR	Decrease only, MCR ≤ ICR ≤ PCR
TBE	Decrease only
RIF	Decrease only (Note 2)
RDF	(Notes 1, 2)
NOTE 1 – The value of RDF may be increased or decreased, subject to the constraint that the ratio RDF/RIF shall not be decreased. (Hence, if RIF is decreased by a factor k, RDF may be decreased by at most a factor k, or it may be increased.) NOTE 2 – The values chosen by a node must obey the above rules, and they need to be chosen in such a way that any combination of the values of these parameters that subsequent nodes are allowed to select according to the negotiation rules will be acceptable to the node. NOTE 3 – If the exchange is not able to provide the PCR which is greater than or equal to MCR, then the connection shall be released.	

2.17 Signalling procedures for negotiation of AAL type parameter

Up to two AAL type parameters may be received from the access side in case of AAL type negotiation, in a descending order of priority.

When two AAL type parameters are received in a given order, the network shall transport these parameters and guarantee that their order is preserved.

If the network does not support repeated AAL type parameters, only the second AAL type parameter can be discarded.

2.17.1 Procedure

The procedure starts from the principle that the AAL type information element received from the access in the descending order of priority is delivered to the destination side in the same order.

3 Maintenance Control, Application Process functions

This clause contains the description of the Application Process functions relating to:

- The reset of resources;
- The blocking of Virtual Paths;
- Remote User Part Availability procedure;
- Transmission alarm handling;
- Signalling Congestion Control procedure;
- Destination unavailability control;
- VPCI/VPI consistency check procedure.

3.1 Introduction

The Maintenance Control functions in the Application Process use the services provided by the SACF. These are listed in Table 3-1.

The primitives on this interface, in many cases, correspond with B-ISUP messages, this is also indicated in Table 3-1.

Table 3-1/Q.2764 – Maintenance Control primitives between AP and SACF

Primitive name	Types	Corresponding B-ISUP message(s)
Error	Indication	–
Block_Resource	Request/Indication/Response/Confirmation	Blocking, Blocking Acknowledgement
Unblock_Resource	Request/Indication/Response/Confirmation	Unblocking, Unblocking Acknowledgement
Reset_Resource	Request/Indication/Response/Confirmation	Reset, Reset Acknowledgement
User_Part_Available	Request/Indication/Response/Confirmation	User Part Test, User Part Available
Destination_Unavailable	Indication	–
Destination_Available	Indication	–
Remote_Status	Indication	–
Check_Resource_Begin	Request/Indication/Response/Confirmation	Consistency Check Request, Consistency Check Request Acknowledgement
Check_Resource_End	Request/Indication/Response/Confirmation	Consistency Check End, Consistency Check End Acknowledgement

Tables 3-2 to 3-8 (see 3.10) list the mandatory contents for these primitives.

When the Application Process starts a new maintenance procedure, it creates a new instance of the B-ISUP AE to handle the signalling. When the procedure is complete, typically when the appropriate confirmation primitive is received, the AEI is deleted.

3.2 Reset

The reset procedure is used to return signalling identifiers and connection elements (virtual channel links/path connections) to the idle condition. The procedure is invoked under abnormal conditions; when the current status of the Signalling Identifiers (SIDs) or the Connection Element Identifiers (CEIs) are unknown or ambiguous. For example, a switching system that has suffered memory mutilation will not know the status of Signalling Identifiers (SIDs) and virtual channel connections, e.g. idle, busy incoming, busy outgoing, etc. The identifiers and virtual channel links/path connections (and any associated bandwidth) between the two adjacent nodes should therefore be reset to the idle condition. The resources are therefore made available for new traffic.

In order to indicate what resource is to be reset, the Reset_Resource request contains a Resource Identifier parameter. If the resource indicator is set to "remote SID", the resource value will indicate the local SID reference at the sending node (the remote reference at the receiving node). If the resource indicator is set to "local SID", then the resource value will indicate the remote SID reference at the sending node (the local reference at the receiving node). If the resource indicator is

set to "CEI VPCI", or "CEI VPCI/VCI", the resource value will indicate the virtual channel link/path connection common to both the sending and receiving nodes.

The reset procedure should be initiated for:

a) Signalling anomalies detected by the B-ISUP signalling system. The following anomalies are detected by the protocol procedures, reported to the exchange management functions, and thus initiate the reset procedure:

1)	Unexpected message received while awaiting the IAM Acknowledge message (detected by BCC ASE)	Action: Reset remote SID.
2)	Unexpected message received while awaiting the Address Complete message (detected by CC ASE)	Action: Reset local SID.
3)	Timer "Await Release Complete" expiry (detected by BCC ASE)	Action: Reset VPCI/VCI.
4)	Unexpected message received relating to an unallocated SID (detected by BCC ASE)	Action: Reset remote SID.
5)	Timer "Await IAM Acknowledge" expiry (detected by BCC ASE)	Action: Assigning exchange: Reset VPCI/VCI and remove the VPCI/VCI and bandwidth from service. Non-assigning exchange: Reset remote SID.
6)	Call Control Application Process detects a missing mandatory parameter in a received primitive	Action: Reset local SID.
7)	Unexpected MOD message received while awaiting the Address Complete message or the Answer message, (detected by CC ASE).	Action: Reset local SID.
8)	IAM message received which does not contain an Origination SID but does contain a Destination SID (detected by SACF).	Action: Reset remote SID.
9)	IAA message received which does not contain an Origination SID but does contain a Destination SID (detected by SACF).	Action: Reset remote SID.
10)	Call/bearer control related message received, which is not an IAM and which contains an OSID but does not contain a DSID (detected by the SACF).	Action: Reset local SID.

b) Maintenance action due to memory mutilation, e.g. losing of the association information between a signalling ID and a Connection Element identifier.

c) Maintenance action involving start-up and restart of an exchange and/or a signalling system: Reset of each affected VPCI.

3.2.1 Actions at Reset initiating exchange

To initiate reset, a Reset_Resource request primitive is issued. The primitive will contain the resource identifier.

On issuing the Reset_Resource request primitive, the exchange should (if applicable) stop sending ATM cells on the connection.

On issuing the Reset_Resource request primitive, the exchange shall start timer "Repeat Reset".

On receiving the Reset_Resource confirmation primitive, the exchange shall stop timer "Repeat Reset".

On receiving the Reset_Resource confirmation primitive, the affected exchange will place the referenced resource it controls in the "idle" state, and return all associated bandwidth on the virtual path which the exchange controls to the "available" state (i.e. send indication to resource control mechanism).

If the resource reset was "CEI: VPCI", the exchange shall idle all associated signalling identifiers, i.e. delete all signalling associations related to that VPCI.

The Virtual Path blocking conditions are affected by reset of CEI: VPCI as follows:

a) Any local blocking condition related to the reset VPCI is removed when the Reset_Resource confirmation primitive is received.

b) Any remote blocking condition related to the reset VPCI is removed when the Reset_Resource confirmation primitive is received, unless a Block_Resource indication has been received, since the sending of the Reset_Resource, relating to the concerned VPCI; in which case the remote blocking condition is (re-)instated.

The blocking conditions are unaffected by other types of reset.

The exchange should notify the maintenance system of the outcome of the procedure.

3.2.2 Actions at Reset responding exchange

On receiving a Reset_Resource indication primitive, the receiving (unaffected) exchange will:

a) If it is the incoming or outgoing exchange on a connection in any call/connection state, the exchange should accept the message as a request to idle resources it controls. It responds by sending a Reset_Resource response primitive after the indicated resource, the bandwidth if it is the controlling exchange for the virtual path affected and all associated identifiers (SIDs, VPCI/VCIs, where applicable) on the concerned link, have been made available for new traffic.

   If a CEI VPCI is reset, then all associated VCIs and SIDs on the virtual path link should be released.

b) If the received resource (SID, VPCI/VCI, VPCI) is not allocated (idle condition), accept the primitive as a release request and therefore respond by sending a Reset_Resource response.

c) Any interconnected virtual path/channel links and all associated resources, will be released by an appropriate method (e.g. Release), except in the case of call/connections that are currently awaiting the Incoming_Resources_Accepted indication: in this case an automatic repeat attempt is applicable.

d) If the primitive is received after having sent a Reset_Resource request primitive, respond by a Reset_Resource response primitive. The associated identifiers and the bandwidth if applicable should be made available for service.

e) If the Resource indicator is set to "CEI: VPCI" and if the affected virtual path is in a locally blocked state, the Reset_Resource indication shall be accepted as a request to idle all resources (signalling identifiers, VPCI, VPCI/VCI). The affected virtual path is returned to the locally blocked state. A Block_Resource request with a Resource indicator set to "CEI: VPCI" indicating the affected virtual path shall be sent. A Reset_Resource response shall be issued following the Block_Resource request primitive.

f) If the Resource indicator is set to "CEI: VPCI" and if the affected virtual path is in a remotely blocked state, the remotely blocked state shall be removed.

3.2.3 Abnormal Reset procedures

a) If a Reset_Resource confirmation is received which is not a correct response to a sent Reset_Resource request, it is discarded.

b) If a Reset_Resource indication is received requesting reset of a resource (e.g. connection element identifier) that is not controlled by the B-ISDN User Part, it is discarded.

c) If an Error indication primitive is received indicating that timer "Await Reset Acknowledgement" has expired in the MC ASE, and if timer "Repeat Reset" has not yet expired for the first time, the Reset procedure is repeated as described in 3.2.1 without restarting the timer "Repeat Rest".

   If timer "Repeat Reset" expires, the "Repeat Reset" timer shall be started again, and the Reset procedure is repeated as described in 3.2.1. The maintenance system shall be informed on the first expiry of timer "Repeat Reset", and this procedure shall continue until the Reset_Resource confirmation primitive is received, or until maintenance intervention occurs.

3.3 Blocking and unblocking of virtual paths

The virtual path blocking procedure is provided to prevent a virtual path from being selected for carrying new non-test call/connections. This procedure can be initiated automatically, e.g. under fault conditions, or manually, to permit testing or other exchange management functions, e.g. to perform the VPCI Consistency Check procedure.

Blocking can be initiated by the exchange at either end of a virtual path. At both ends the virtual path is put into a blocked state and the bandwidth becomes unavailable. A blocked virtual path cannot be selected for new non-test traffic by either exchange; however, test call/connections can be completed in either direction independent of the blocking state. Test call/connections must not return a virtual path to service.

An acknowledgement is required for each blocking and unblocking request. The acknowledgement is not sent until the appropriate action – blocking or unblocking, has been taken.

Unblocking can only be initiated by the same exchange which initiated the blocking procedures sending an Unblocking, or Reset (VPCI) request (see also 3.2.2). At either end, the blocked state is removed and the bandwidth becomes available again.

3.3.1 Initiating blocking

When the exchange initiates the blocking procedure it issues the Block_Resource request primitive, with the Resource identifier set to "CEI: VPCI", and indicating the affected VPCI. The virtual path is put into the locally blocked state, and so no new non-test call/connections can be completed over this virtual path, in either direction.

When the Block_Resource confirmation primitive is received, the maintenance system is informed of the completion of the blocking.

3.3.2 Initiating unblocking

When the exchange initiates the unblocking procedure it issues the Unblock_Resource request primitive, with the Resource identifier set to "CEI: VPCI", and indicating the affected VPCI.

When the Unblock_Resource confirmation primitive is received, the local blocking condition for the virtual path is removed. The maintenance system is informed.

3.3.3 Receiving blocking

When the exchange receives the Block_Resource indication primitive, indicating the affected VPCI, the virtual path is put into the remotely blocked state, the bandwidth becomes unavailable, and so no

new non-test call/connections can be completed over this virtual path, in either direction. A Block_Resource response primitive is then issued.

3.3.4 Receiving unblocking

When the exchange receives the Unblock_Resource indication primitive, indicating the affected VPCI, the remotely blocked state for the virtual path is removed, the bandwidth becomes available again for traffic, and the Unblock_Resource response primitive is issued.

3.3.5 Abnormal procedures

a) If a Block_Resource indication is received for a virtual path connection which is already in a remotely blocked state, a Blocking Acknowledgement message shall be sent.

b) If an Unblock_Resource indication is received for a virtual path connection which is not in a remotely blocked state, an Unblocking Acknowledgement message shall be sent.

c) If an Error indication primitive is received indicating that an error has been detected in the MC blocking protocol state machines, the maintenance system shall be informed.

d) If a Block_Resource indication or Unblock_Resource indication is received for a virtual path connection which is not under the control of the B-ISDN User Part, it is discarded.

e) If a Set_Up indication primitive is received without any indication of a test call for a locally blocked VPCI then the Set_Up indication is rejected with cause # 35 " Requested VPCI/VCI not available" and the initial blocking procedure is repeated.

3.4 User Part Availability procedure

3.4.1 Inaccessible User Part

On receipt of a Remote_Status indication primitive with the cause "User Part unavailability – inaccessible remote user", the B-ISDN User Part shall:

a) Mark the concerned User Part unavailable.

b) Inform the management/overload function, and all virtual paths/channels to that destination are blocked for new call/connections. Call/connections in progress need not be released even though signalling messages cannot be sent to the affected exchange. (While it may not be technically necessary to release call/connections in progress, network providers may choose to release such call/connections, perhaps after some time interval, if there is a concern about overcharging due to the exchange's inability to completely clear the call/connection when either the calling or called party disconnects.)

c) Start the availability test procedure by issuing a User_Part_Available request primitive.

On receipt of a User_Part_Available confirmation primitive, or any other primitive relating to the far User Part, the B-ISDN User Part shall:

a) Mark the concerned User Part available.

b) Inform the management/overload function, and the virtual paths/channels will be unblocked, and any of them in the idle state can be used for call/connections immediately. Normal call/connection release procedures that may have started during the period of signalling isolation continue and as such will ensure that affected virtual paths/channels are returned to idle state.

c) Delete the associated Maintenance AEI.

If a User_Part_Available indication primitive is received, the B-ISDN User Part will respond by sending a User_Part_Available response primitive, if it is available. If it is not available, no action shall be taken.

3.4.2 User Part Unavailability – Unknown

On receipt of a Remote_Status indication primitive with the cause "User Part unavailability – unknown", the B-ISDN User Part shall:

a) Inform the management/overload function.

3.4.3 Unequipped User Part

On receipt of a Remote_Status indication primitive with the cause "User Part unavailability – unequipped remote user", the B-ISDN User Part should inform the management system and all virtual paths/channels to that destination are blocked for new call/connections. Call/connections in progress need not be released even though signalling messages cannot be sent to the affected exchange. (While it may not be technically necessary to release call/connections in progress, network providers may choose to release such call/connections, perhaps after some time interval, if there is a concern about overcharging due to the exchange's inability to completely clear the call/connection when either the calling or called party disconnects.)

3.5 Transmission alarm handling

Since fully digital transmission systems are provided between two exchanges, which have some inherent fault indication feature giving an indication to the switching system when faults on transmission path level and/or virtual path level are detected, the switching system shall inhibit selection of the virtual paths concerned for the period the fault conditions persist. No special actions are required for active call/connections.

3.6 Automatic congestion control

Automatic congestion control is used when an exchange is in an overload condition (see also ITU-T Recommendation Q.542). Two levels of congestion are distinguished, a less severe congestion threshold (congestion level 1) and a more severe congestion threshold (congestion level 2).

If either of the two congestion thresholds is reached, an Automatic Congestion Level parameter is included in all Release request and Incoming_resources_rejected[5] primitives. This parameter indicates the level of congestion (congestion level 1 or 2) to the adjacent exchanges. The adjacent exchanges, when receiving this Automatic Congestion Level parameter should reduce their traffic to the overload affected exchange.

If the overloaded exchange returns to a normal traffic load, it will cease including Automatic Congestion Level parameters in Release request and incoming resources rejected primitives.

The adjacent exchanges then, after a predetermined time, automatically return to their normal status.

3.6.1 Receipt of a Release indication or incoming_resources_rejected indication containing an Automatic Congestion Level parameter

When a Release indication or incoming_resources_rejected indication primitive is received containing an Automatic Congestion Level parameter, the B-ISDN User Part should pass the appropriate information to the signalling system independent network management/overload control function within the exchange. This information consists of the received congestion level information and the node identification to which the congestion level applies.

Automatic congestion level actions are only applicable to exchanges adjacent to the congested exchange. Therefore, an exchange that receives a Release indication or incoming_resources_rejected

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[5] Communication is assumed between the Maintenance Application Process functions and the Call Control Application Process functions to achieve this.

indication primitive containing an Automatic Congestion Level parameter should discard that parameter after notifying the network management/overload control function.

3.6.2 Actions taken during overload

Whenever an exchange is in an overload state (congestion level 1 or 2), the signalling system independent network management/overload control function will direct the B-ISDN User Part to include an Automatic Congestion Level parameter in every Release request and incoming_resources_rejected request primitive issued by the Application Process.

The network management/overload control function will indicate which congestion level (1 or 2) to code in the Automatic Congestion Level parameter.

When the overload condition has ended, the network management/overload control function will direct the B-ISDN User Part to cease including Automatic Congestion Level parameter in the Release request and incoming_resources_rejected request primitives.

3.7 B-ISDN User Part signalling congestion control

3.7.1 General

On receipt of a Remote_Status indication primitive that indicates "signalling network congestion", the B-ISDN User Part should reduce traffic load (e.g. call/connection attempts) into the affected destination point code in several steps.

3.7.2 Procedures

When the first congestion indication is received by the B-ISDN User Part, the traffic load into the affected destination point code is reduced by one step. At the same time, two timers "Short SCC" and "Long SCC" are started. During period "Short SCC" all received congestion indications for the same destination point code are ignored in order not to reduce traffic too rapidly. Reception of a congestion indication after the expiry of timer "Short SCC", but still during period "Long SCC", will decrease the traffic load by one more step and restart timers "Short SCC" and "Long SCC". This step wise reduction of the B-ISDN User Part signalling traffic is continued until maximum reduction is obtained by arriving at the last step. If timer "Long SCC" expires (i.e. no congestion indications having been received during the "Long SCC" period) traffic will be increased by one step and timer "Long SCC" will be restarted unless full traffic load has been resumed.

The number of steps of traffic reduction and the type and/or amount of increase/decrease of traffic load at the various steps are considered to be an implementation matter.

3.8 Destination Availability

On the reception of a Destination_Unavailable indication primitive, the B-ISDN User Part takes the following action.

If the affected destination is not a destination (Signalling Point) known by the B-ISDN User Part (not connected by virtual paths/channels to the exchange), no action takes place.

If the affected destination is a destination (Signalling Point) known by the B-ISDN User Part, all virtual paths/channels to that destination are blocked for new call/connections.

Call/connections in progress need not be released even though signalling messages cannot be sent to the affected exchange. (While it may not be technically necessary to release call/connections in progress, network providers may choose to release such call/connections, perhaps after some time interval, if there is a concern about overcharging due to the exchange's inability to completely clear the call/connection when either the calling or called party disconnects.)

On the reception of a Destination_Available indication primitive, the B-ISDN User Part takes the following action.

If the affected destination is not a destination (Signalling Point) known by the B-ISDN User Part (not connected by virtual paths/channels to the exchange), no action takes place.

If the affected destination is a destination (Signalling Point) known by the B-ISDN User Part, the virtual paths/channels will be unblocked, and any of them in the idle state can be used for call/connections immediately. Normal call/connection release procedures that may have started during the period of signalling isolation continue and as such will ensure that affected virtual paths/channels are returned to idle state.

3.9 VPCI/VPI Consistency Check

The VPCI Consistency Check is provided to verify the consistent and correct allocation of a logical Virtual Path Connection Identifier to a Virtual Path on an interface in both connected exchanges. The check is performed to guarantee that a user plane information flow is possible between the two adjacent exchanges using the bilaterally agreed logical Virtual Path Connection Identifier. This is done using the Loopback Capability of ITU-T Recommendation I.610 that operates on the Virtual Path Level. The consistency of the logical Virtual Path Connection Identifier is checked at the far end by monitoring the receipt of a user plane test flow in Virtual Path at a particular interface that is indicated by the Virtual Path Connection Identifier. After the performance of the check, the result of the Loopback test (continuity at the Virtual Path level) is available in the initiating node. The result of the monitoring function (receipt of Loopback cells at the Virtual Path Connection level) is available at the adjacent node and is sent back to the initiating exchange. The procedure can be initiated automatically or manually. The VPCI Consistency Check should be initiated for only one Virtual Path Connection to any adjacent node at a time.

The VPCI Consistency Check can be initiated by an exchange at either end of a Virtual Path Connection. The Virtual Path Connection to be tested must be blocked when the procedure is initiated.

Consistency Check Begin and Consistency Check End are confirmed operations. The acknowledgement is not sent until the appropriate action – start or stop of the user plane test flow supervision procedure – has been taken.

The end of the VPCI Consistency Check can only be initiated by the same exchange which initiated the procedure by sending a Consistency Check End request.

3.9.1 Initiating Consistency Check Request

When an exchange initiates the Consistency Check procedure, it issues the Check_Resource_Begin request primitive. The Resource Identifier is set to "Connection element identifier: VPCI" and the affected Virtual Path Connection Identifier is included. The standardized Virtual Channel Identifier for F4 flows is used (see ITU-T Recommendation I.610).

When the Check_Resource_Begin confirmation primitive is received, the maintenance system is informed about the completion of the VPCI Consistency Check connection setup and the user plane test flow is initiated.

3.9.2 Receiving Consistency Check Request

When the exchange receives the Check_Resource_Begin indication primitive, indicating the affected Virtual Path Connection, the primitive is accepted as a request for a VPCI Consistency Check connection set-up and the maintenance system is informed. The user plane test flow monitoring function is connected to the standardized Virtual Channel for F4 flows (see ITU-T Recommendation I.610) in the indicated Virtual Path Connection. A Check_Resource_Begin response primitive is issued.

3.9.3 Initiating Consistency Check End

When an exchange initiates the end of the Consistency Check procedure, the user plane test flow is stopped and the Check_Resource_End request primitive is issued.

When the Check_Resource_End confirmation primitive is received, it contains the Consistency Check Result Information. The VPCI Check Result Indicator is set to the result of the user plane test flow monitoring function at the logical Virtual Path Connection level. The maintenance system is informed about the completion and the result of the check and the VPCI Consistency Check connection is released.

3.9.4 Receiving Consistency Check End

When the exchange receives the Check_Resource_End indication primitive, the user plane test flow monitoring function is disconnected. The maintenance system is informed about the completion of the test. The VPCI Consistency Check connection is released and the Check_Resource_End response primitive is issued. The Check_Resource_End response primitive contains the Consistency Check Result Information. The VPCI Check Result Indicator is set to the result of the user plane test flow monitoring function at the logical Virtual Path Connection level. If, due to any reason, the monitoring function could not be performed properly, the VPCI Check Result Indicator shall be set to "Virtual Path Connection Identifier check not performed".

3.9.5 Abnormal procedures

a) If a Check_Resource_Begin confirmation primitive is received which is not a correct response to a sent Check_Resource_Begin request, it is discarded.

b) If a Check_Resource_End confirmation primitive is received which is not a correct response to a sent Check_Resource_End request, it is discarded.

c) If a Check_Resource_Begin indication primitive is received requesting a VPCI Consistency Check for a Virtual Path Connection that is not controlled by the B-ISDN User Part, it is discarded.

d) If an Error indication primitive is received indicating that timer "Await Consistency Check Request Acknowledgement" has expired in the MC ASE, the maintenance system shall be informed.

e) If an Error indication primitive is received indicating that timer "Await Consistency Check End Acknowledgement" has expired in the MC ASE, the maintenance system shall be informed.

f) If a Check_Resource_Begin indication primitive is received requesting a VPCI Consistency Check for a Virtual Path Connection for which a Check_Resource_Begin request primitive has been issued, it is discarded.

3.10 Primitive contents

Tables 3-2 to 3-8 list the mandatory and optional contents for the SACF Maintenance Control service primitives.

For primitives generated by the Application Process, these tables indicate which parameters must be generated.

For primitives received by the Application Process, if the primitive does not contain a parameter indicated as Mandatory, the primitive is discarded.

Table 3-2/Q.2764 – Parameters for Block/Unblock/Reset_Resource Request/Indication primitive

Block/Unblock/Reset_Resource Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Resource Identifier	M

Table 3-3/Q.2764 – Parameters for Block/Unblock/Reset_Resource Response/Confirmation primitive

Block/Unblock/Reset_Resource Response/Confirmation	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M

Table 3-4/Q.2764 – Parameters for User_Part_Available Request/Indication/Response/Confirmation primitives

User_Part_Available Request/Indication/Response/Confirmation	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M

Table 3-5/Q.2764 – Parameters for Check_Resource_Begin Request/Indication primitive

Check_Resource_Begin Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Resource Identifier	M

Table 3-6/Q.2764 – Parameters for Check_Resource_Begin Response/Confirmation primitives

Check_Resource_Begin Response/Confirmation	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M

Table 3-7/Q.2764 – Parameters for Check_Resource_End Request/Indication primitive

Check_Resource_End Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M

Table 3-8/Q.2764 – Parameters for Check_Resource_End Response/Confirmation primitive

Check_Resource_End Response/Confirmation	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Consistency Check Result Information	M

4 Compatibility, Application Process functions

4.1 Introduction

4.1.1 Primitive interface

Unrecognized messages are passed to/from the B-ISUP AEI using the Unrecognized_Message_Type request/indication primitive. This primitive carries all the parameters received in the unrecognized message, with the exception of the Destination SID parameter (the addition and deletion of this being done at the NI AEI interface) (see Table 4-1).

Table 4-1/Q.2764 – Compatibility primitives between AP and SACF

Primitive name	Types	Corresponding B-ISUP message(s)
Unrecognized_Message_Type	Request/Indication	Any unrecognized message
Confusion	Request/Indication	Confusion

Unrecognized parameters can appear in any primitive on the interface between the Application Process and its Application Entity, and they are passed, within the Application Process, to the Compatibility functions described in this subclause.

4.1.2 General requirements on receipt of unrecognized signalling information

The general rule is that:

- Every message contains a Message Compatibility Information field.
- Every parameter contains a Parameter Compatibility Information field.

It may happen that an exchange receives unrecognized signalling information, i.e. messages, parameter types or parameter values. This can typically be caused by the upgrading of the signalling system used by other exchanges in the network. In these cases the following compatibility procedures are invoked to ensure the predictable network behaviour.

The procedures to be used on receipt of unrecognized information make use of:

- compatibility information received in the same message as the unrecognized information;
- the Confusion request/indication primitive;
- the Release request/indication/response/confirmation primitive;
- the Incoming_Resources_Rejected request/indication primitive;
- the Cause Indicators parameter.

The following causes are used:

– "message type non-existent or not implemented, discarded";

– "parameter non-existent or not implemented, discarded";

– "message with unrecognized parameter, discarded".

For all the above causes a diagnostic field is included containing, dependent on the cause, either the unrecognized parameter name(s), the message type code, or the message type code and the unrecognized parameter name(s).

The procedures are based on the following assumptions:

a) The forward compatibility information contains different instructions for different exchanges. There are two types of exchanges, type A- and type B-exchanges. The classification of type A- and B-exchanges to the functions an exchange may perform is listed below. It is determined on a per-call/connection basis.

Definitions of the exchange types:

Type A

- Originating exchange, i.e. the exchange in which the call/connection is generated from a national public network point of view.
- Destination exchange, i.e. the exchange to which the call/connection is destined from a national public network point of view.
- Interworking exchange, i.e. the exchange in which interworking is performed between B-ISDN User Part and the N-ISDN User Part.
- Incoming or outgoing international exchange (see Note).

  NOTE – In an incoming or outgoing international exchange, the instruction to pass on a message or a parameter does not preclude the normal policing functions of these exchanges. It is recommended that an exchange interconnecting two national networks should behave as an incoming or outgoing international exchange.

Type B

a) National or international transit exchange, i.e. an exchange that acts just as a transit node.

b) Since type A- and type B-exchanges can be both national and international exchanges, the compatibility mechanism is applicable to the national and international network.

c) If an exchange receives a Confusion indication, or a Release indication or confirmation primitive indicating an unrecognized message or parameter received, it assumes interaction with an exchange at a different functional level. See 4-3 for more details on this.

d) When handling recognized information, type-B exchanges pass on the compatibility information unchanged.

When an unrecognized parameter or message is received, the exchange will find some corresponding instructions contained in the parameter compatibility information or message compatibility information field respectively. The message compatibility information contains the instructions specific for the handling of the complete message.

The instruction indicators are a set of boolean indicators. The following general rules apply to the examination of these instruction indicators:

a) Depending on the role of the exchange in the call/connection, i.e. type A or type B, and the settings of the indicators only a subset of the indicators are examined, some being ignored.

   Only type B-exchanges examine the "Transit at Intermediate Exchange indicator". If it is set to "Transit Interpretation", the other indicators are ignored. If it is set to "End Node Interpretation", the according actions are performed.

Type A-exchanges always interpret the remaining indicators, i.e. all indicators except the "Transit at Intermediate Exchange indicator".

Consequently, "End Node Interpretation" means that all kinds of exchanges, i.e. type A and type B, have to interpret the instruction indicators.

b) Instruction indicators marked as "spare" are not examined. They may be used by future phases of the B-ISDN User Part; in this case the future phase of the B-ISDN User Part will set the currently defined instruction indicators to a reasonable value for the current phase. This rule ensures that more types of instructions can be defined in the future without creating a backward compatibility problem.

c) When an exchange receives an unrecognized parameter, it must decide what exchange type it is for the call/connection before performing the compatibility actions.

d) At a type B-exchange, the unrecognized information should be passed on unchanged, if the "Transit at Intermediate exchange indicator" is set to "Transit Interpretation".

e) At a type A-exchange, the "Transit at Intermediate Exchange indicator" is not applicable.

f) At a type B-exchange that has not been instructed to pass on the unrecognized information, or at a type A-exchange, if the "Release Call indicator" is set to "Release Call", the call/connection is released.

g) At a type B-exchange that has not been instructed to pass on the unrecognized information or at a type A-exchange, in any case the following is applicable if the "Release Call indicator" is set to "Do Not Release Call":

- if the "Discard Message indicator", or the "Discard Parameter indicator" is set to "Discard Message/Discard Parameter", the message or parameter is discarded, as instructed;
- and then, if the "Send Notification indicator" is set to "Send Notification", a Confusion request primitive is issued towards the exchange that sent the unrecognized information.

h) For the case of an unrecognized parameter, it is possible for the instruction to require that either the unrecognized parameter or the whole message is discarded. This provides for the case where the sending exchange determines that it is not acceptable for the message to continue being processed without this parameter.

i) In case a message is used for more than one procedure simultaneously and the codings of the instruction indicator of the message compatibility information described in the corresponding texts are different, the instruction indicator is set according to the most stringent combination of the possible codings (i.e. the coding "1" of a bit in the instruction indicator is dominant).

j) At a type A-exchange where "pass on" has been specified for a message or parameter and "pass on" is not possible, then the "pass on not possible indicator" and "send notification indicator" are checked.

k) At a type A-exchange which is acting as a broadband/narrow-band interworking exchange, the Broadband/narrow-band Interworking indicator is examined, if present, rather than the Release Call, Discard Message, or Discard Parameter (if applicable) indicators.

l) Tables 4-2 and 4-3 clarify the handling of the received compatibility information.

Table 4-2/Q.2764 – Handling of combinations of message compatibility instruction indicators

Instruction indicator			Required action
Release Call indicator	**Send Notification indicator**	**Discard Message indicator**	
0	0	0	Pass on message (Note 2)
0	0	1	Discard message
0	1	0	Pass on message (Notes 2 and 3)
0	1	1	Discard message and send notification
1	x	x	Release call/connection

NOTE 1 – "x" = do not care.

NOTE 2 – Applicable to type B-exchanges and incoming or outgoing international exchanges. Other exchanges (e.g. originating, terminating) shall check the "Pass on not possible indicator" to determine the required action.

NOTE 3 – In case of passing on a message, no notification is sent, the "Send Notification indicator" is ignored.

Table 4-3/Q.2764 – Handling of combinations of parameter compatibility instruction indicators

Instruction indicator				Required action
Release Call indicator	**Send Notification indicator**	**Discard Message indicator**	**Discard Parameter indicator**	
0	0	0	0	Pass on parameter (Note 2)
0	0	0	1	Discard parameter
0	0	1	0	Discard message
0	0	1	1	Discard message
0	1	0	0	Pass on parameter (Notes 2 and 3)
0	1	0	1	Discard parameter and send notification
0	1	1	0	Discard message and send notification
0	1	1	1	Discard message and send notification
1	x	x	x	Release call/connection

NOTE 1 – "x" = do not care.

NOTE 2 – Applicable to type B-exchanges and incoming or outgoing international exchanges. Other exchanges (e.g. originating, terminating) shall check the "Pass on not possible" indicator to determine the required action.

NOTE 3 – In case of passing on a parameter, no notification is sent, the "Send Notification indicator" is ignored.

4.2 Procedures for the handling of the unrecognized messages or parameters

A Confusion request primitive must not be issued in response to a received Confusion indication, Incoming_resources_rejected indication, Release indication or Release confirmation primitive. Any unrecognized parameters received in a Confusion indication, Incoming_resources_rejected indication, or Release confirmation primitive are discarded.

4.2.1 Unrecognized Messages – Type A- and Type B-exchanges

Depending on the instructions received in the "Message Compatibility Information parameter", a type A-exchange receiving an unrecognized message will either:

- transfer the message transparently;
- discard the message;
- discard the message and send confusion; or
- release the call/connection.

A Release, Incoming_Resources_Rejected and a Confusion request primitive shall include the cause #97 "message type non-existent or not implemented – discarded", followed by a diagnostic field containing the message type code.

4.2.2 Unrecognized parameters – Type A- and Type B-exchanges

Unexpected parameters (a parameter in the "wrong" message) are handled like unrecognized parameters.

Depending on the instructions received in the "Parameter Compatibility Information field", an exchange receiving an unrecognized parameter will either:

- transfer the parameter transparently;
- discard the parameter;
- discard the message;
- discard the parameter and send confusion;
- discard the message and send confusion; or
- release the call/connection.

A Confusion request primitive shall include the cause:

- #99 "parameter non-existent or not implemented – discarded" followed by a diagnostic field containing the parameter name; or
- #110 "message with unrecognized parameter discarded", followed by a diagnostic field containing the message name and the name of the first detected unrecognized parameter which caused the message to be discarded.

A Confusion request primitive may refer to multiple unrecognized parameters.

An exchange receiving a message including multiple unrecognized parameters shall process the different instruction indicators, associated with those parameters, according to the following order:

1) release the call/connection;
2) discard the message and send confusion;
3) discard the message.

A Release or an Incoming_Resources_Rejected request primitive shall include cause #99 "parameter non-existent or not implemented – discarded" followed by a diagnostic field containing the parameter name.

If a Release indication primitive is received containing an unrecognized parameter, depending on the instructions received in the compatibility information parameter the exchange will either:

- transfer the parameter transparently;
- discard the parameter; or
- discard the parameter and send a cause #99 "parameter non-existent or not implemented – discarded", in the Release response primitive.

4.2.3 Unrecognized parameter values

Any parameter values marked as "spare", "reserved" or "national use" in ITU-T Recommendation Q.2763 may be regarded as unrecognized.

If an exchange receives and detects a recognized parameter, but the contents are unrecognized, then the procedures as stated for unrecognized parameters apply. There is no specific compatibility information field for each parameter value. For all parameter values contained in a parameter, the compatibility information of the parameter applies.

4.3 Procedures for the handling of responses indicating unrecognized information has been sent

4.3.1 Type A-exchanges

Action taken on receipt of these primitives at an originating or terminating exchange will depend on the call/connection state and the affected service.

The definition of any procedure that is outside the basic call/connection setup protocol, as defined in this ITU-T Recommendation, should include procedures for handling responses that indicate that another exchange has received, but not recognized, information belonging to that procedure. The procedure receiving this response should take the appropriate actions.

The default action taken on receipt of a Confusion indication primitive is to discard the primitive without disrupting normal call/connection processing.

4.3.2 Type B-exchanges

a) *Confusion* (message type non-existent or not implemented – discarded)

An exchange receiving Confusion (message type non-existent or not implemented – discarded) has to determine the appropriate subsequent actions as described for type A-exchanges in the above paragraph.

b) *Confusion* (parameter non-existent or not implemented – discarded, or passed on)

The actions taken at a type B-exchange, on receipt of a Confusion indication primitive will depend on whether the exchange has the functionality to generate the parameter identified in the diagnostic field:

1) If the exchange does not have the functionality to generate the parameter, the decision on what action should be taken is deferred to an exchange that does contain this functionality. This is achieved by passing the Confusion primitive transparently through the type B-exchange.
2) If this exchange does have the functionality to generate the parameter, the procedural element that created or modified the information should determine any subsequent actions, as described for type A-exchanges above.

c) *Release indication and confirmation*

Action taken on receipt of a Release indication or confirmation primitive, or an Incoming_Resources_Rejected indication, with cause indicating unrecognized information is as for the normal procedures for these messages.

The above actions are summarized in Tables 4-4a, and 4-4b.

Table 4-4a/Q.2764 – Handling of responses indicating unrecognized information has been sent

Exchange has the functionality to generate the information		
	Cause	
Message	**Parameter discarded**	**Message discarded**
Confusion indication	(Procedure dependent action)	
Release indication	Normal procedures	Not applicable
Release confirmation	Normal procedures	Not applicable
Incoming_Resources_Rejected indication	Normal procedures	Not applicable

Table 4-4b/Q.2764 – Handling of responses indicating unrecognized information has been sent

Exchange does not have the functionality to generate the information		
	Cause	
Message	**Parameter discarded**	**Message discarded**
Confusion indication	Defer action (transit Confusion)	
Release indication	Normal procedures	Not applicable
Release confirmation	Normal procedures	Not applicable
Incoming_Resources_ Rejected indication	Normal procedures	Not applicable

5 Network Interface function

5.1 Introduction

The Network Interface (NI) function is part of B-ISUP that provides a transport interface for instances of the B-ISUP AE.

The MTP-3 Service Primitive interface is a single interface within an exchange, but multiple instances of signalling associations exist within one exchange. (See Annex A for further explanation of this.)

5.2 Primitive Interfaces

5.2.1 MTP interface

The interface to the MTP is the MTP-3 Service Primitive interface defined in clause 6/Q.2761.

5.2.2 AEI interface

The following primitives are present on the interface between the NI and the SACF in the B-ISUP AE (interface e in Annex A). See Table 5-1.

Table 5-1/Q.2764 – Primitive between NI and SACF

Primitive name	Types
Transfer	Request/Indication
Remote_Status	Indication
Destination_Unavailable	Indication
Destination_Available	Indication

5.3 Procedures

5.3.1 Message format errors

MTP_Transfer indication primitives received from the MTP (interface g in Annex A) are decoded according to the formatting rules defined in ITU-T Recommendation Q.2763.

Message format errors may be detected if:

a) A parameter's length indicator causes the overall message length to be exceeded.

b) A parameter header goes beyond the received message length, i.e. the received message length is not equal to the end of the last parameter.

When a message format error is detected, the message shall be discarded.

For the purposes of format error detection, the message length indicator is used.

NOTE – A format error can be detected in both recognized and unrecognized messages.

5.3.2 Distribution

MTP_Transfer indication primitives received from the MTP are distributed to AEIs, using the mapping indicated in Table 5-2, according to the following rules, based on the Destination SID parameter in the message:

- If the Destination SID corresponds to an existing B-ISUP AEI, the message is distributed to that AEI.
- If the Destination SID does not correspond to an existing B-ISUP AEI, an instance of B-ISUP, including an AEI, is created. This new instance is allocated a new SID value. The type of the SAL created is determined by examination of the received message type (This is probably an error, and will be handled by the protocol machines in the AE).
- If the message does not contain a Destination SID parameter, but it does contain an Origination SID parameter, a new instance of B-ISUP, including an AEI, is created. This new instance is allocated a new SID value.
- If the message does not contain a Destination SID parameter nor an origination SID parameter, a protocol error has occurred and the message is discarded.

The MTP_Status, MTP_Pause and MTP_Resume indication primitives are distributed, using the mapping indicated in Table 5-2, to a B-ISUP AEI containing a Maintenance SAO. The specific AEI is determined by the examination of the indicated affected remote Signalling Point Code. If such an AEI does not currently exist for the indicated point code, one is created.

When a Transfer request primitive is received from a B-ISUP AEI it is mapped into a MTP_Transfer request primitive. The SIO and SLS fields are completed as specified in ITU-T Recommendation Q.2763.

5.3.3 Primitive mapping

Tables 5-2 and 5-3 show the primitive mapping performed by the NI.

Table 5-2/Q.2764 – NI primitive mappings from MTP to SACF

Interface g from MTP-3	Interface e to SACF
MTP_Transfer indication	Transfer indication
MTP_Status indication	Remote_Status indication
MTP_Pause indication	Destination_Unavailable indication
MTP_Resume indication	Destination_Available indication

Table 5-3/Q.2764 – NI primitive mappings from SACF to MTP

Interface e from SACF	Interface g to MTP-3
Transfer request	MTP_Transfer request

5.4 SDL diagrams

If any difference is found between the procedures described in these SDLs and the procedures described in the text, the text shall take precedence (see Figure 5-1).

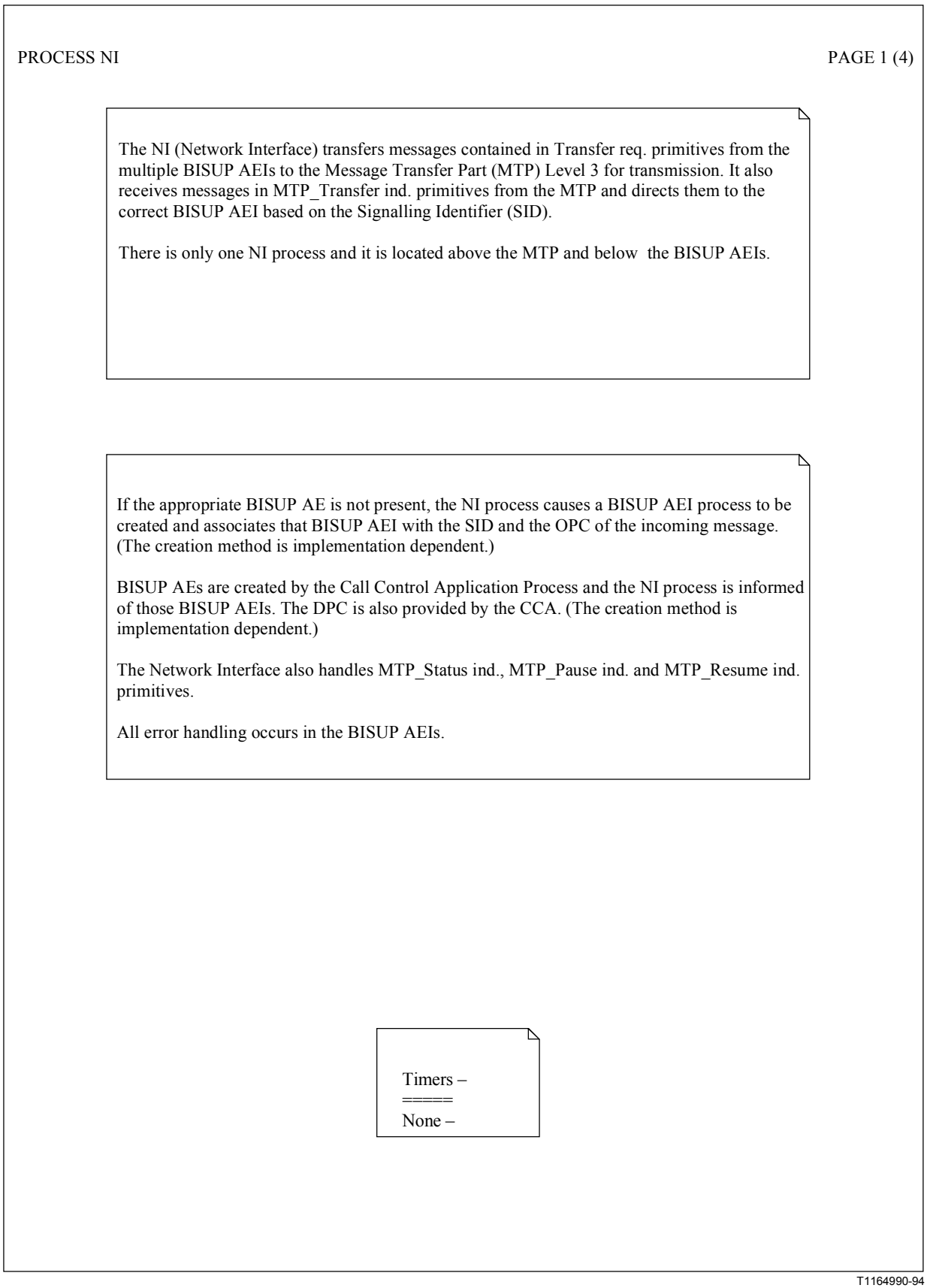


Figure 5-1/Q.2764 ***(sheet 1 of 4)***

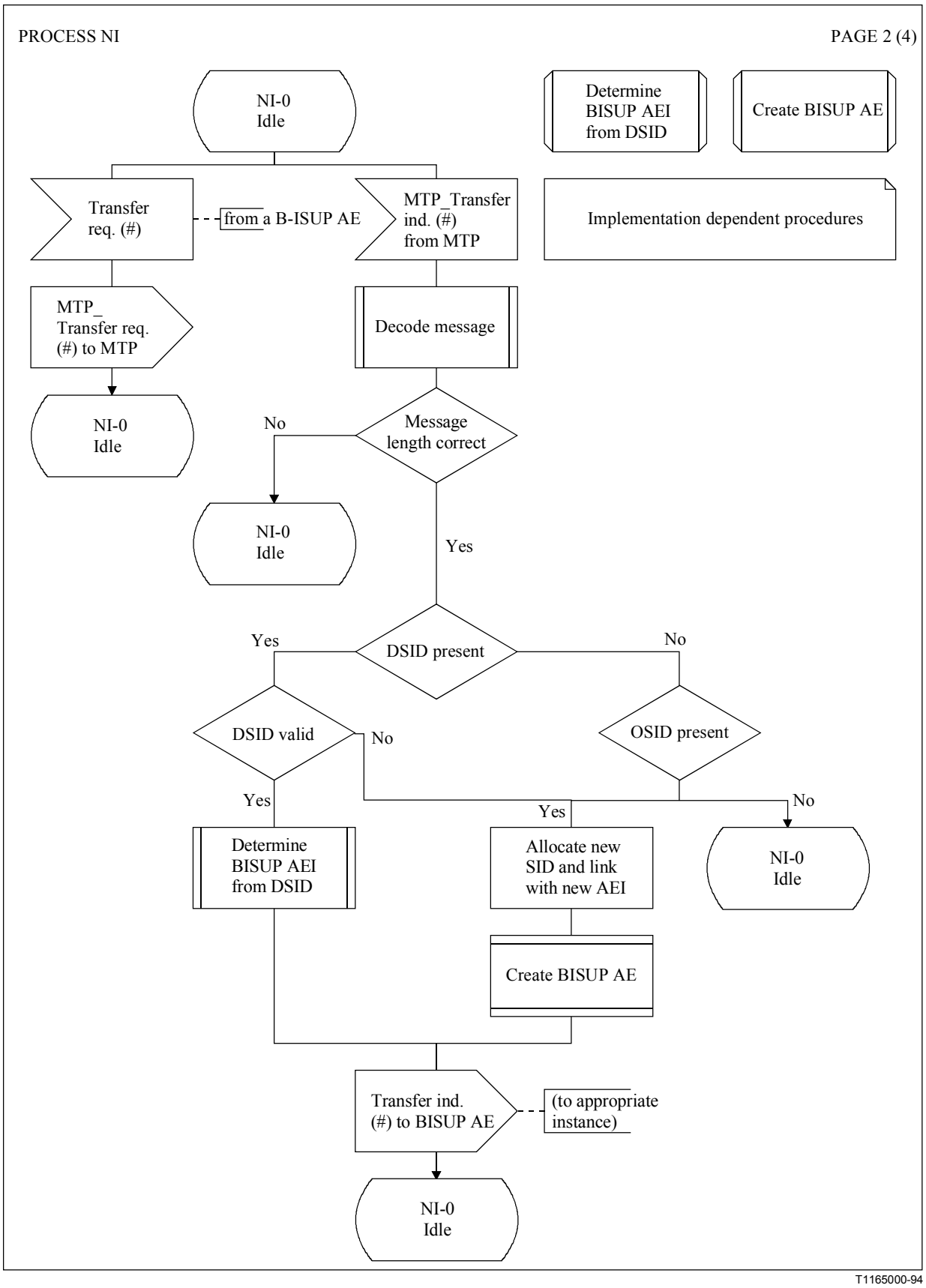


Figure 5-1/Q.2764 ***(sheet 2 of 4)***

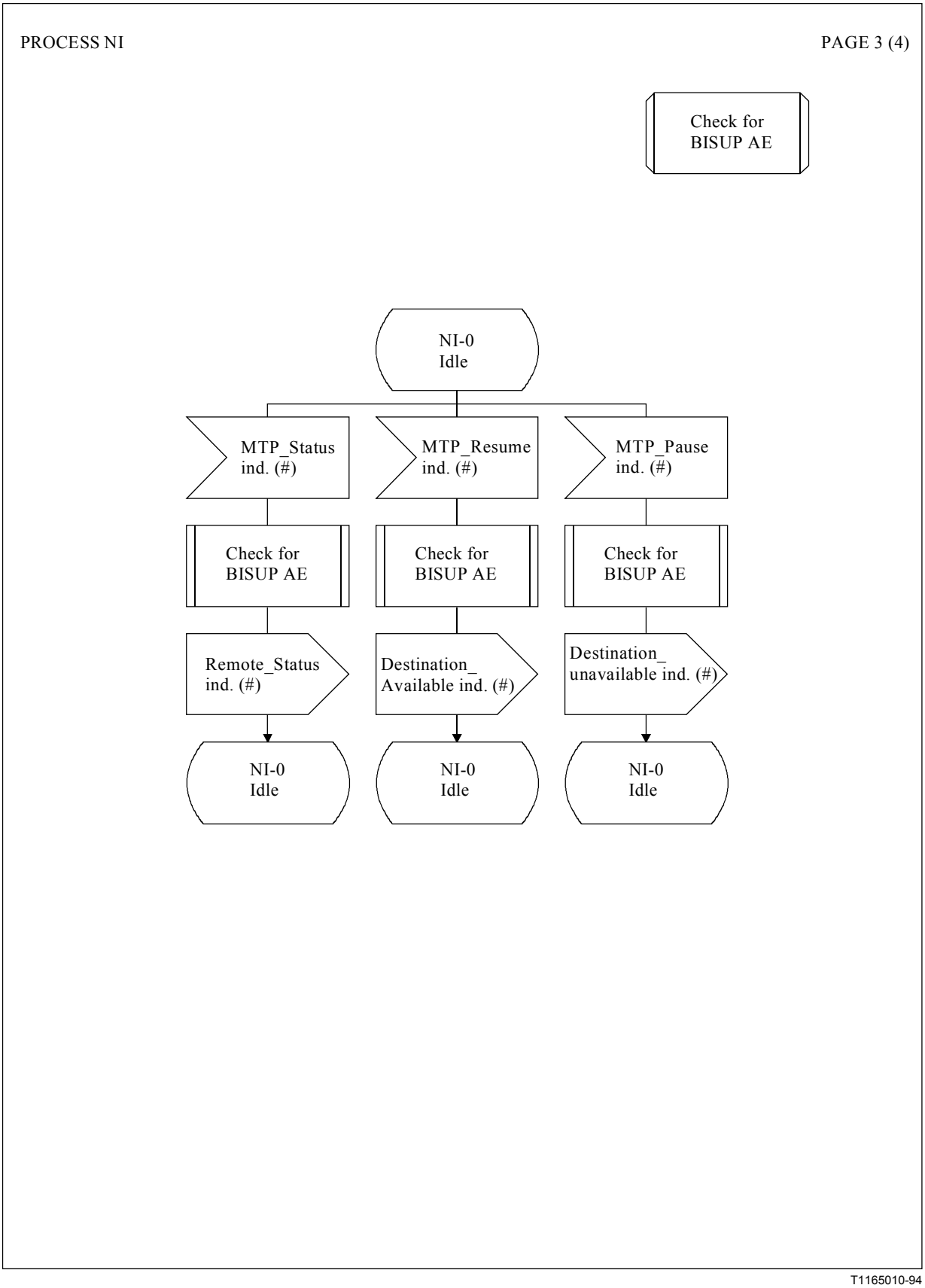


Figure 5-1/Q.2764 ***(sheet 3 of 4)***

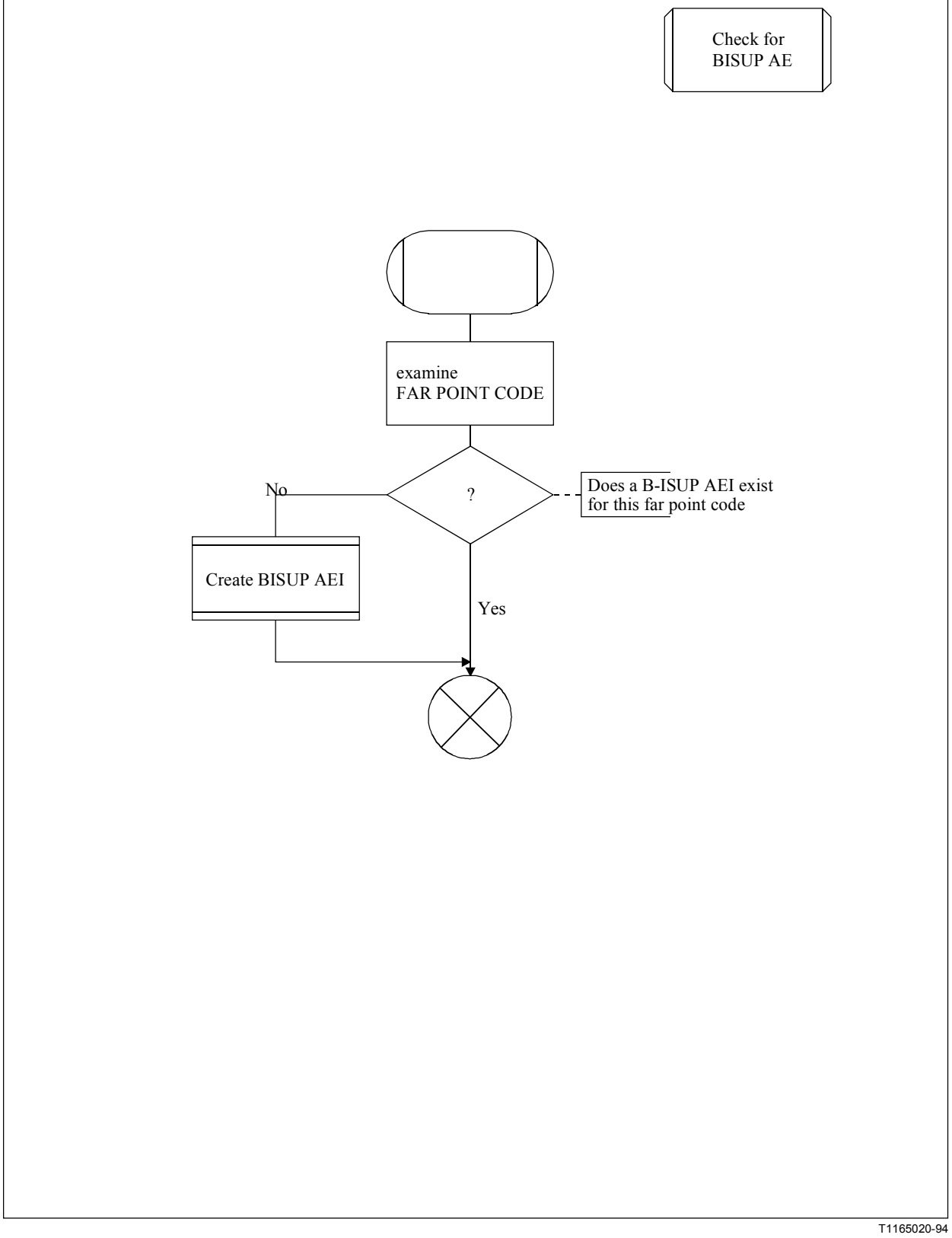


Figure 5-1/Q.2764 ***(sheet 4 of 4)***

6 Single Association Control Function (SACF)

6.1 Introduction

The service primitive technique, used to define the B-ISUP ASEs and the SACF specific to Signalling Capability Set 1 and beyond, is a way of describing how the services offered by an ASE – the provider of (a set) of service(s) – can be accessed by the user of the service – the SACF or the Application Process (AP).

The service primitive interface is a conceptual interface and is not a testable or accessible interface. It is a descriptive tool. The use of service primitives at an interface does not imply any particular implementation of that interface, nor does it imply that an implementation must conform to that particular service primitive interface to provide the stated service.

When defining the SACF rules there is a natural tendency to follow a linear, sequential description. However, it is emphasized that there is **no** implication that an implementation follows such a temporal ordering of the steps.

All conformance to the B-ISUP specifications is based on the external behaviour at a node, i.e. on the generation of the correct message structure (as specified in ITU-T Recommendation Q.2763) and in the proper sequence (as specified in this ITU-T Recommendation).

The following subclauses describe the rules followed by the SACF.

Annex A contains figures that give a graphical impression of the actions of SACF.

6.2 Outgoing messages

On receipt of a primitive [request or response] from the AP, via interface d, the SACF issues appropriate primitive(s) to the ASEs, populating the parameters in the generated primitives from the appropriate subset of the parameters received from the AP.

The primitives present on interface d are listed in Tables 2-1, 3-1 and 4-1.

The parameters in these primitives are listed in Tables 2-2 to 2-18 and 3-2 to 3-8.

The primitives present in the interface between SACF and BCC ASE, b, are listed in Table 7-1.

The parameters in these primitives are listed in Tables 7-2 to 7-11.

The primitives present in the interface between SACF and CC ASE, c, are listed in Table 8-1.

The parameters in these primitives are listed in Tables 8-3 to 8-14.

The primitives present in the interface between SACF and MC ASE, a, are listed in Table 9-1.

The parameters in these primitives are listed in Tables 9-2 to 9-9.

The primitives present in the interface between SACF and UI ASE, f, are listed in Table 10-1.

The primitives received from the AP, on interface d, are mapped as shown in Table 6-1:

Table 6-1a/Q.2764 – Mapping between AP and ASE primitives

Interface d, from AP	Interface c, to CC ASE	Interface b, to BCC ASE	Interface a to MC ASE
Set_Up req.	Call_Set_Up req.	Link_Set_Up req.	
Address_Complete req.	Call_Address_Complete req.	Link_Information req. (Note 1)	
Incoming_Resources_Accepted req.	–	Link_Accepted req.	
Incoming_Resources_Rejected req.	–	Link_Rejected req.	Congestion_Level req. (Note 2)
Subsequent_Address req.	Call_Subsequent_Address req.		
Release req./rsp.	Call_Release req.	Link_Release req./rsp.	Congestion_ Level req. (Note 2)
Pre-Release_Info req./rsp	Call_Pre-Release_Info req./rsp.	–	–
Answer req.	Call_Answer req.	Link_Information req. (Note 1)	
Progress req.	Call_Progress req.	Link_Information req. (Note 1)	
Suspend req.	Call_Suspend req. (Note 3)	–	
Resume req.	Call_Resume req. (Note 3)	–	
Forward_Transfer req.	Call_Forward_Transfer req.	–	
Network_Resource_Management req.	–	Link_Resource_ Management req.	
Segment req. (national use)	Call_Segment req.	Link_Information req. (Note 1)	
Block_Resource req./rsp.			Block req./rsp.
Unblock_Resource req./rsp.			Unblock req/rsp.
Reset_Resource req./rsp.			Reset req./rsp.
User_Part_Available req./rsp.			User_Part_ Available req./rsp.

NOTE 1 – The Link_Information request is issued to BCC ASE if the Echo Control Information, AAL Parameters, AAL prime parameters, Broadband Low Layer Information, CDVT, Narrow-band Low Layer Compatibility, Narrow-band Bearer Capability, OAM Traffic Descriptor or Call History parameters are present.

NOTE 2 – The Congestion_Level request is issued to MC ASE if the Automatic Congestion Level parameter is present.

NOTE 3 – The Call_Suspend/Call_Resume request primitives are issued to CC ASE if the Suspend/resume indicators parameter indicates "network initiated".

Table 6-1b/Q.2764 – Mapping between AP and ASE primitives

Interface d, from AP	Interface c, to CC ASE	Interface b, to BCC ASE	Interface a to MC ASE
Check_Resource_Begin req./rsp.			Check_Begin req./rsp.
Check_Resource_End req./rsp.			Check_End req./rsp.
Modify req.	Call_Modify req.	Link_Modify req.	–
Modify rsp.	–	Link_Modify rsp.	–
Modify_Rejected req.	–	Link_Modify_Rejected req.	–
Connection_Available req.	Call_Connection_ Available req.	–	–
	Interface f to UI ASE		
Unrecognized_Message_ Type req.	Unrecognized_Message req.		
Confusion req.	Confusion req.		

The output(s) from the CC, BCC, UI and/or MC ASEs are received by SACF in the Transfer request primitive. These primitives are used to populate the User_data field of the Transfer request primitive on interface e, to the Network Interface. The formatting of the B-ISUP message in the User_data field of the Transfer request primitive is done as specified in ITU-T Recommendation Q.2763.

The SACF constructs the message type to be sent based upon the primitives issued to the various ASEs, as shown in Tables 6-2 to 6-4.

a) *Call/Bearer control primitives*

See Table 6-2.

Table 6-2/Q.2764 – Mapping from BCC CC and MC ASE primitives to B-ISUP messages

Interface c, to CC ASE	Interface b, to BCC ASE	Interface a, to MC ASE	Message type
Call_Set_Up req.	Link_Set_Up req.		Initial Address
–	Link_Accepted req.		IAM Acknowledge
–	Link_Rejected req.	Congestion_Level req. (Note 3)	IAM Reject
Call_Subsequent_ Address req.	–		Subsequent Address
Call_Release req.	Link_Release req.	Congestion_Level req. (Note 3)	Release
Call_Pre-Release_Info req.			Pre-Release Information
–	Link_Release rsp.		Release Complete
Call_Address_Complete req.	Link_Information req. (Note 3)		Address Complete
Call_Answer req.	Link_Information req. (Note 3)		Answer

Table 6-2/Q.2764 – Mapping from BCC CC and MC ASE primitives to B-ISUP messages *(concluded)*

Interface c, to CC ASE	Interface b, to BCC ASE	Interface a, to MC ASE	Message type
Call_Progress req.	Link_Information req. (Note 3)		Call Progress
Call_Suspend req.	–		Suspend
Call_Resume req.	–		Resume
Call_Forward_ Transfer req.	–		Forward Transfer
–	Link_Resource_ Management		Network Resource Management
Call_Segment req.	Link_Information req. (Note 3)		Segmentation
Call_Modify req.	Link_Modify req.	–	Modify Request
–	Link_Modify rsp.	–	Modify Acknowledge
–	Link_Modify_Rejected req.	–	Modify Reject
Call_Connection_ Available req.	–	–	Connection Available

NOTE 1 – All the above messages include Signalling ID parameter(s), for a description of the use of these parameters see 6.4.

NOTE 2 – An instance of the BCC and CC ASEs is identified by a local Signalling ID, allocated by the exchange from a pool of such identifiers when the instance of the B-ISUP AE is created (when a Set_Up request primitive is issued, for an outgoing call/connection; when an IAM is received for an incoming call/connection).

All subsequent B-ISUP messages related to this simultaneous call/bearer connection are identified by this local Signalling ID.

The Signalling ID is released to the pool when the exchange deletes the AEI, e.g. when the Release response or confirmation primitive, or when a Link_Accepted (Failure) request or indication primitive, has been received.

NOTE 3 – Optional primitive, see Table 6-1.

b) *Maintenance primitives*

See Table 6-3.

Table 6-3/Q.2764 – Mapping between MC ASE primitives and B-ISUP messages

Interface a, to MC ASE	Message type
Block req.	Blocking
Block rsp.	Blocking Acknowledgement
Unblock req.	Unblocking
Unblock rsp.	Unblocking Acknowledgement
Reset req.	Reset
Reset rsp.	Reset Acknowledgement
User_Part_Test req.	User Part Test
User_Part_Test rsp.	User Part Acknowledgement
Congestion_Level req.	See Table 6-2
Check_Begin req.	Consistency Check Request
Check_Begin rsp.	Consistency Check Request Acknowledgement
Check_End req.	Consistency Check End
Check_End rsp.	Consistency Check End Acknowledgement
NOTE 1 – All the above messages include Signalling ID parameter(s), for a description of the use of these parameters see 6.4. NOTE 2 – An instance of the MC ASE is identified by a local Signalling ID, allocated by the exchange from the pool of such identifiers when the instance of the B-ISUP AE is created. All subsequent messages related to this specific MC ASE service primitive invocation are identified by this local Signalling ID. The Signalling ID is released to the pool when the exchange deletes the AEI, i.e. when the Confirmation of the service primitive has been received.	

c) *Unrecognized information primitives*

See Table 6-4.

Table 6-4/Q.2764 – Mapping between UI ASE primitives and B-ISUP messages

Interface f, to UI ASE	Message type
Unrecognized_Message_Type req.	As contained in the primitive
Confusion req.	Confusion

The output of the UI ASE, a Transfer request, is used to populate the User_Data field of the Transfer request primitive issued to the Network Interface. The appropriate Destination SID parameter is added.

6.3 Incoming messages

On receipt of a Transfer indication primitive from the Network Interface, the SACF analyses the User Data field of this primitive according to the rules in ITU-T Recommendation Q.2763.

6.3.1 Message and parameter distribution

SACF distributes information based on message type, and parameter types, according to the following rules:

a) *Maintenance messages*

Maintenance messages are given to the MC ASE using a Transfer indication primitive. The following message types are defined to be Maintenance messages:

- Blocking;
- Unblocking;
- Blocking Acknowledgement;
- Unblocking Acknowledgement;
- Reset;
- Reset Acknowledgement;
- User Part Test;
- User Part Available;
- Consistency Check Request;
- Consistency Check End;
- Consistency Check Request Acknowledgement;
- Consistency Check End Acknowledgement.

The information (parameters) included in the Transfer indication primitive is the valid set of parameters for that ASE as indicated in Tables 8-1 and 8-2.

Unrecognized parameters (parameter types) are passed to the UI ASE.

b) *Call/Bearer Control messages*

Call and Bearer Control messages are distributed to CC and BCC ASE as shown in Table 6-5. The message is given to the BCC ASE and/or CC ASE using the Transfer indication primitive.

The information (parameters) included in the Transfer indication, and Transfer indication primitives are the valid set of parameters for those ASEs as indicated in Tables 6-2 to 6-8 (BCC ASE) and Tables 7-2 to 7-11 (CC ASE).

Unrecognized parameters (parameter types) are passed to the UI ASE.

c) Unrecognized messages and Confusion messages are passed to the UI ASE.

d) SACF issues a primitive to the AP, over interface d, based on the primitives it receives from the ASEs as shown in Tables 6-6, 6-7 and 6-8.

Table 6-5/Q.2764 – Distribution of received B-ISUP messages to BCC ASE, CC ASE and MC ASE

Received message	Primitive to BCC ASE	Primitive to CC ASE	Primitive to MC ASE
Address Complete	(Note 1)	Yes	No
Answer	(Note 1)	Yes	No
IAM Acknowledge	Yes	No	No
Initial Address	Yes	Yes	No
IAM Reject	Yes	No	(Note 2)
Call Progress	(Note 1)	Yes	No
Release	Yes	Yes	(Note 2)
Pre-Release Information	No	Yes	No
Resume	No	(Note 3)	No
Release Complete	Yes	No	No
Subsequent Address	No	Yes	No
Suspend	No	(Note 3)	No
Forward Transfer	No	Yes	No
Network Resource Management	Yes	No	No
Segmentation	(Note 1)	Yes	No
Modify Request	Yes	Yes	No
Modify Acknowledge	Yes	No	No
Modify Reject	Yes	No	No
Connection Available	No	Yes	No

NOTE 1 – Primitive issued to BCC ASE if the Echo Control Information, AAL Parameters, AAL prime parameters, Broadband Low Layer Information, CDVT, Extended Quality of Service parameter, Narrow-band Low Layer Compatibility, Narrow-band Bearer Capability, OAM Traffic Descriptor or Call History parameters are present.

NOTE 2 – Primitive issued if the Automatic Congestion Level parameter is present.

NOTE 3 – Primitive issued if the Suspend/resume indicators parameter indicates "network initiated".

Table 6-6/Q.2764 – Mapping between BCC, CC and MC ASE primitives and AP primitives

From BCC, interface b	From CC, interface c	From MC, interface a	Sent to the AP, interface d (Note 1)
Link_Set_Up ind.	Call_Set_Up ind.		Set_Up ind.
Link_Information ind. (Note 3)	Call_Address_ Complete ind.		Address_Complete ind.
Link_Accepted ind.	–		Incoming_Resources_ Accepted ind.
Link_Rejected ind.	–	Congestion_Level ind. (Note 3)	Incoming_Resources_ Rejected ind.
–	Call_Subsequent_ Address ind.		Subsequent_Address ind.
Link_Release ind.	*	Congestion_Level ind. (Note 3)	Release ind.
*	Call_Release ind.		Release ind.
	Call_Pre-Release_Info ind.		Pre-Release_Info Ind.
Link_Release cnf.	–	–	Release cnf
Link_Information ind. (Note 3)	Call_Answer ind.		Answer ind.
Link_Information ind. (Note 3)	Call_Progress ind.		Progress ind.
–	Call_Suspend ind.		Suspend ind.
–	Call_Resume ind.		Resume ind.
–	Call_Forward_ Transfer ind.		Forward_Transfer ind.
Link_Resource_Management ind.	–		Network_Resource_ Management ind.
Link_Information ind. (Note 3)	Call_Segment ind.		Segment ind.
Link_Error ind.	*		Error ind.
*	Call_Error ind.		Error ind.
Link_Modify ind.	Call_Modify ind.	–	Modify ind.
Link_Modify cnf.	–	–	Modify cnf.
Link_Modify_Rejected ind.	–	–	Modify_Rejected ind.
–	Call_Connection_ Available ind.	–	Connection_Available ind.

NOTE 1 – The primitive sent to the AP can also contain unrecognized parameters handled by UI ASE. (Unrecognized_Parameter indication issued by UI ASE.)

NOTE 2 – "–" means not applicable primitive.

"*" means "do not care", i.e. any primitive, or no primitive. (Either ASE can, independently, issue its Error indication on detecting an unexpected message. Such an indication overrides the actions of the other ASE.)

NOTE 3 – Optional primitive, see Table 6-5.

Table 6-7/Q.2764 – Mapping between MC ASE primitives and AP primitives

From MC ASE, interface a	Sent to the AP, interface d
Block ind./cnf.	Block_Resource ind./cnf.
Unblock ind./cnf.	Unblock_Resource ind./cnf.
Reset ind./cnf.	Reset_Resource ind./cnf.
User_Part_Available ind./cnf.	User_Part_Available ind./cnf.
Error ind.	Error ind.
Congestion_Level ind.	See Table 6-6
Check_Begin ind./cnf.	Check_Resource_Begin ind./cnf.
Check_End ind./cnf.	Check_Resource_End ind./cnf.
NOTE – The primitive sent to the AP can also contain unrecognized parameters handled by UI ASE. (Unrecognized_Parameter indication issued by UI ASE.)	

Table 6-8/Q.2764 – Mapping between UI ASE primitives and AP primitives

From UI ASE, interface f	Sent to the AP, interface d
Unrecognized_Message ind.	Unrecognized_Message_Type ind.
Unrecognized_Parameter ind.	See Note 1 to Table 6-6
Confusion ind.	Confusion ind.

6.4 Handling of identifiers

The Exchange Application Process manages the Signalling identifiers. These identifiers identify instances of the B-ISUP AEI. (An overview of the creation and deletion of AEIs is provided in Annex A.)

The Signalling Identifiers (SID) remain constant for the life of the Signalling association.

The Signalling IDs are independently assigned by each of two exchanges concerned, A and B, enabling each exchange to uniquely identify the signalling association (i.e. bearer control association, or maintenance association) and associate the signalling information with this particular signalling association.

The Origination Signalling ID A is assigned by exchange A, when it is sending the first message of a Signalling association; it is used to identify the Signalling association at exchange A.

The Origination Signalling ID B is assigned by exchange B, when it is receiving the first message of a Signalling association; it is used to identify the Signalling association at exchange B.

The Destination Signalling ID A equals the Origination Signalling ID A, and the Destination Signalling ID B equals the Origination Signalling ID B.

For bearer control associations:

- The Initial Address message shall contain the Origination Signalling ID A.
- The IAM Acknowledge message shall contain the Origination Signalling ID B and the Destination Signalling ID A in order to allow mapping between the sending and receiving direction.
- The IAM Reject message shall contain the Destination Signalling ID A.
- All subsequent Call/Bearer Control messages contain the Destination Signalling ID B.
- Figure B.1 illustrates this scenario.

6.4.1 Exceptional procedures

If an Initial Address message is received which does not contain an Origination Signalling ID, but does contain a Destination signalling ID then an Error indication primitive is issued.

If an IAM acknowledgment message is received which does not contain an Origination Signalling ID, but does contain a Destination signalling ID then an Error indication primitive is issued.

If a message is received which is not an Initial address message and is related to call/bearer control and contains an Originating Signalling ID but does not contain a destination Signalling ID, then an Error indication primitive is issued.

If a maintenance control message is received with an incorrect SID the message shall be discarded.

6.5 Other lower layer indication primitives

6.5.1 Destination_Unavailable indication

On receipt of a Destination_Unavailable indication primitive from the NI, on interface e, a Destination_Unavailable indication primitive is passed to the Application Process, on interface d, indicating the destination (DPC) that is unavailable.

6.5.2 Destination_Available indication

On receipt of a Destination_Available indication primitive from the NI, on interface e, a Destination_Available indication primitive is passed to the Application Process, on interface d, indicating the destination (DPC) that is now available.

6.5.3 Remote_Status indication

On receipt of a Remote_Status indication primitive from the NI, on interface e, a Remote_Status indication primitive is passed to the Application Process, on interface d. The primitive indicates the destination for which signalling congestion exists, or at which the B-ISDN User Part is unavailable, and the reason for its unavailability.

6.6 SDL diagrams

If any difference is found between the procedures described in these SDLs and the procedures described in the text, the text shall take precedence (see Figure 6-1).

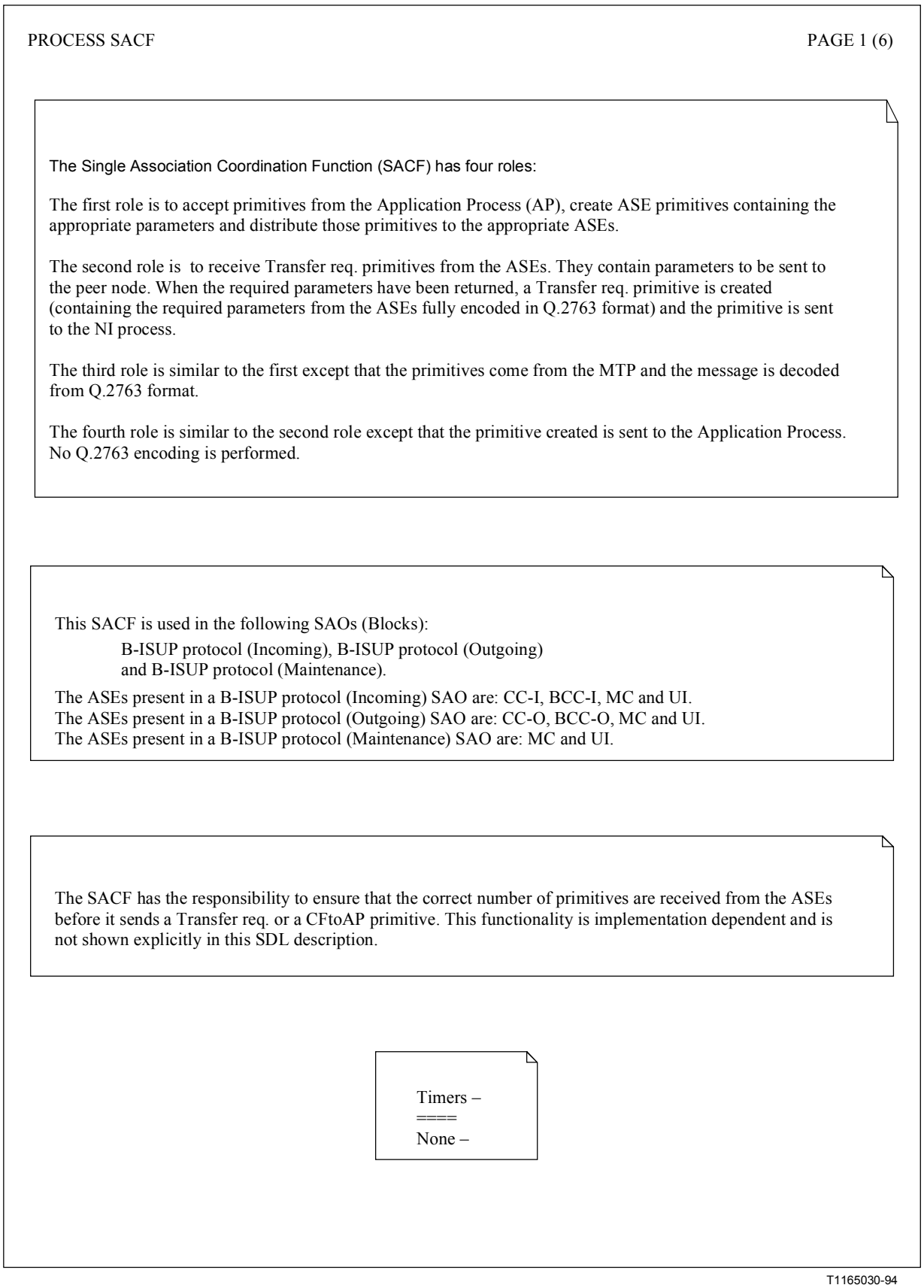


Figure 6-1/Q.2764 ***(sheet 1 of 6)***

SIGNAL LISTS
==========

For CCA, CA and MCA related Primitives
==========

APtoCF Primitive
---

see signal list SL CC1, SL CA1, SL MC1

CFtoAP_Primitive
---

see signal list SL CC2, SL CA2, SL MC2

SIGNAL LIST (continued)
==========

ASE related Primitives
==========

ASEtoCF primitives

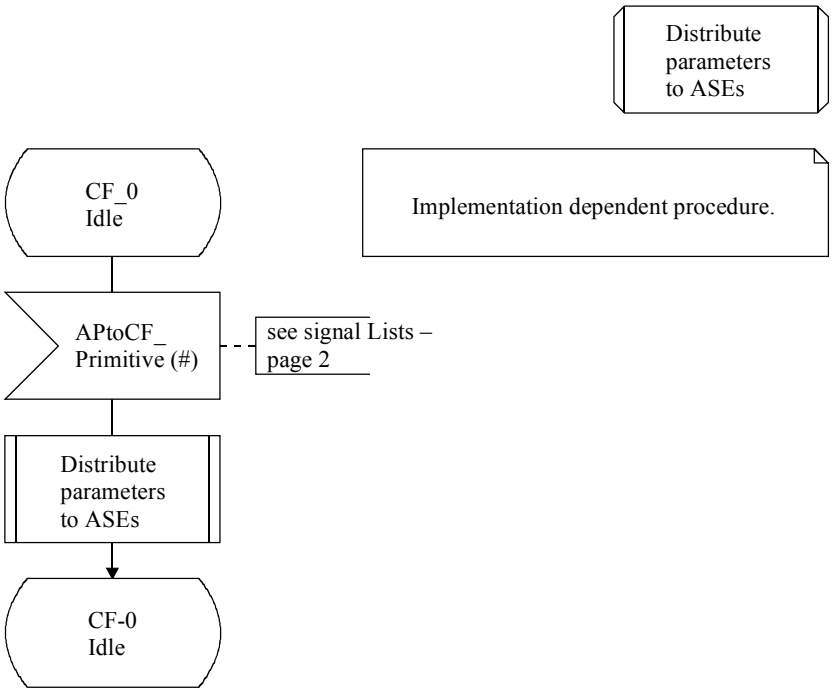
When SACF is in B-ISUP protocol (Incoming) see signal list SLCI1, SLBI1, SLM1, SLU1.
When SACF is in B-ISUP protocol (Outgoing) see signal list SLCO1, SLBO1, SLM1, SLU1.
When SACF is in B-ISUP protocol (Maintenance) see signal list SLM1, SLU1.

CFtoASE primitives

When SACF is in B-ISUP protocol (Incoming) see signal list SLCI2, SLBI2, SLM2, SLU2.
When SACF is in B-ISUP protocol (Outgoing) see signal list SLCO2, SLBO2, SLM2, SLU2.
When SACF is in B-ISUP protocol (Maintenance) see signal list SLM2, SLU2.

T1165040-94

Figure 6-1/Q.2764 ***(sheet 2 of 6)***



T1165050-94

Figure 6-1/Q.2764 ***(sheet 3 of 6)***

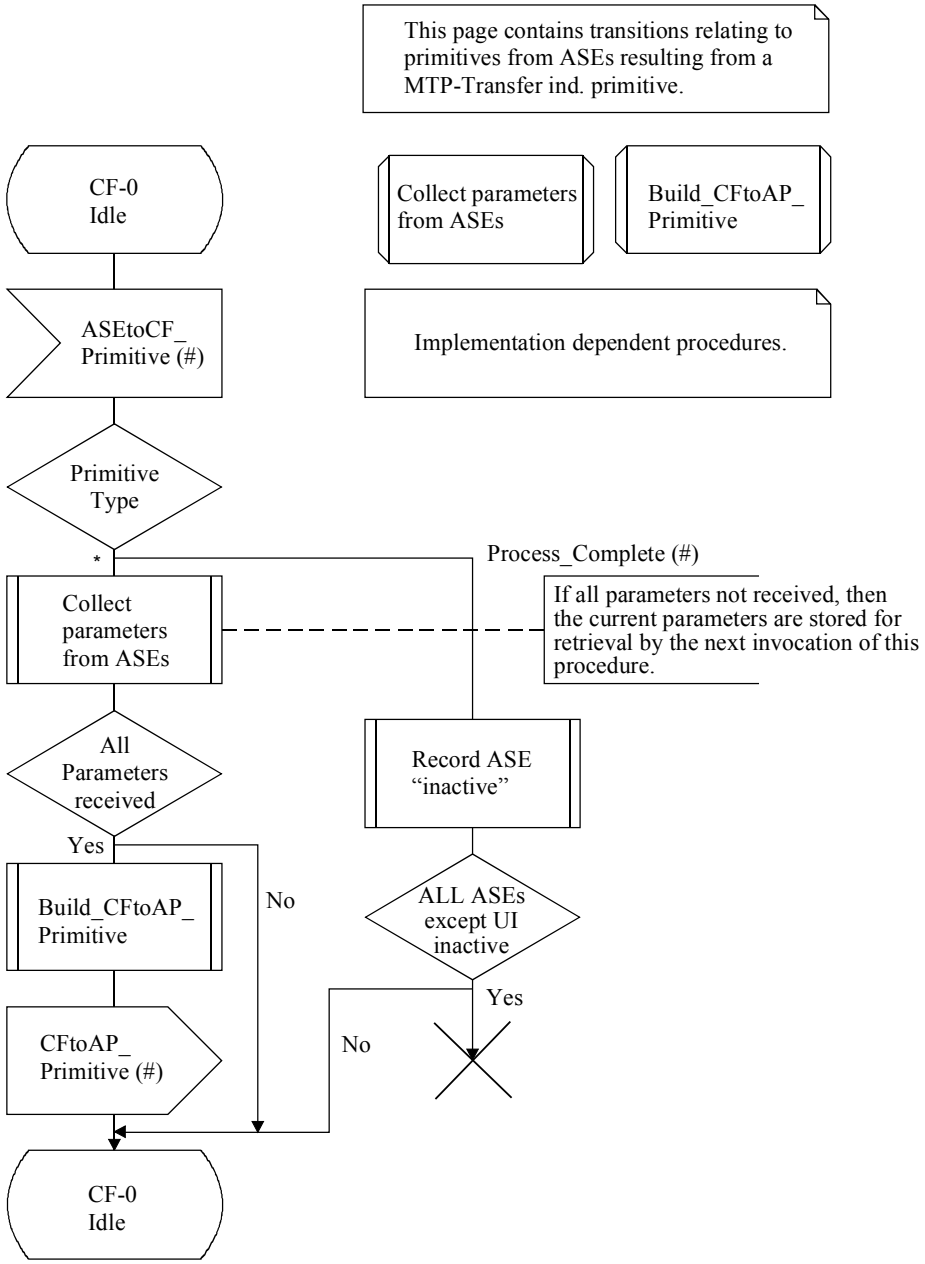


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Figure 6-1/Q.2764 ***(sheet 4 of 6)***

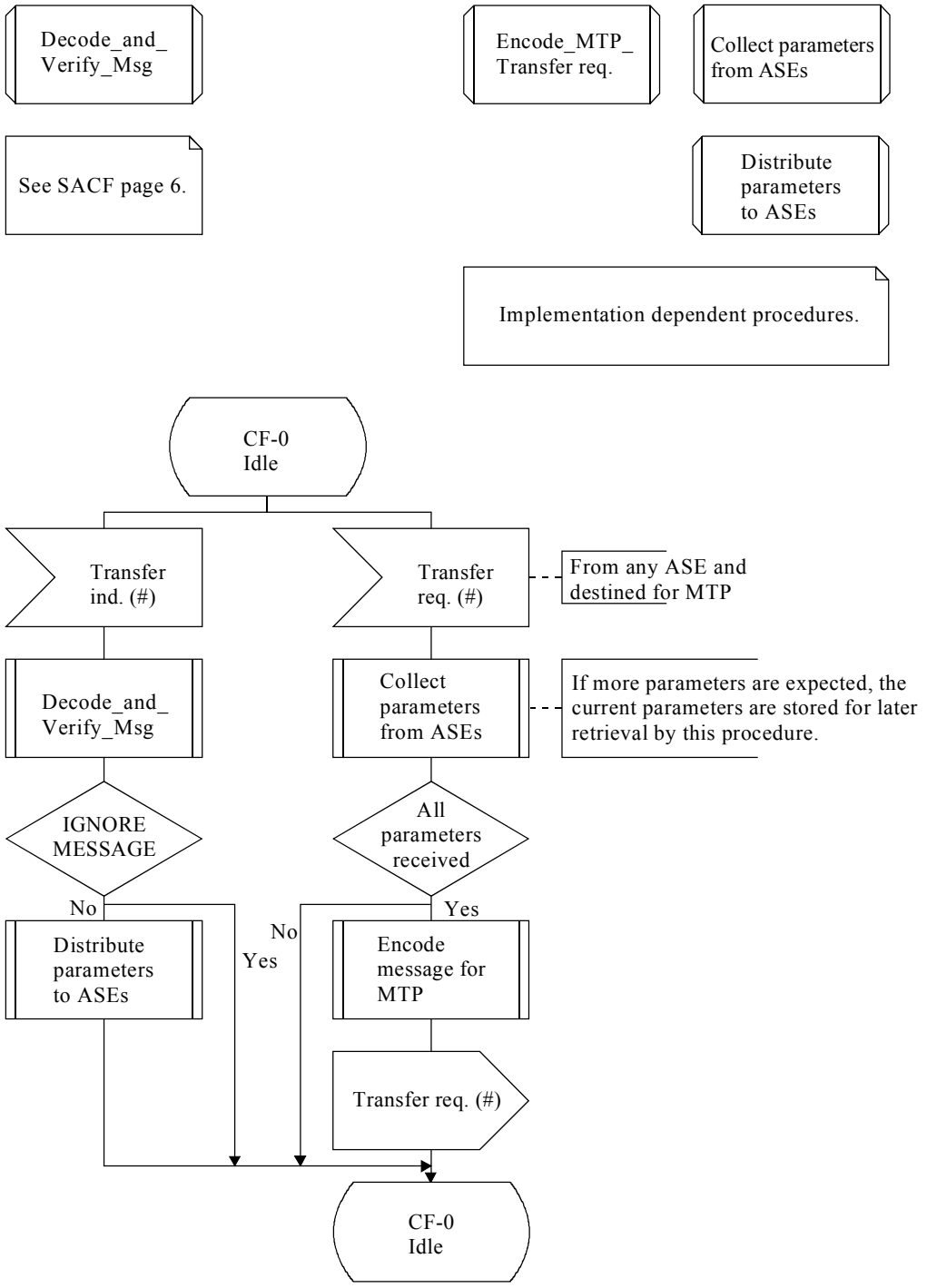

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Figure 6-1/Q.2764 ***(sheet 5 of 6)***

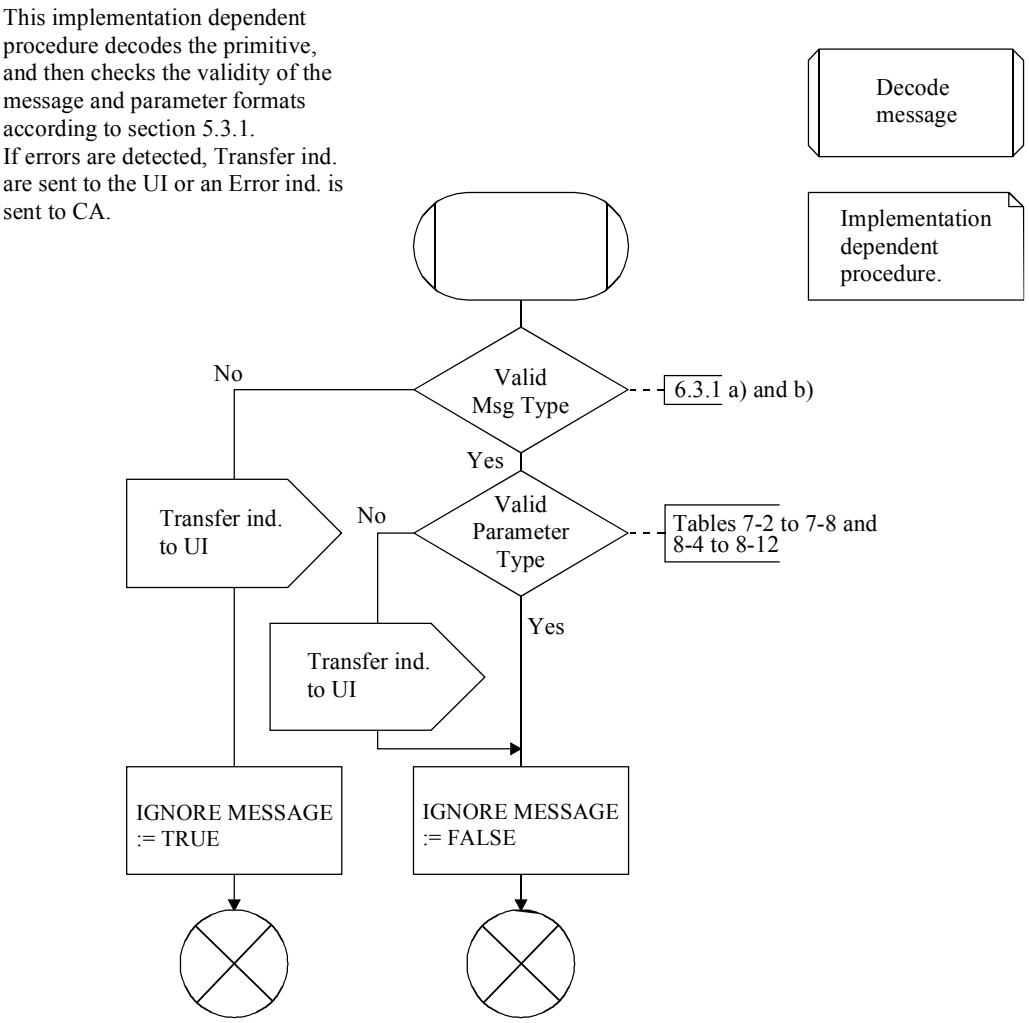

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Figure 6-1/Q.2764 ***(sheet 6 of 6)***

7 Bearer Connection Control ASE (BCC ASE)

This clause specifies all the protocol procedures that relate to the setup and cleardown of connections between adjacent exchanges.

BCC ASE procedures are described in two parts:

- Outgoing BCC ASE; and
- Incoming BCC ASE.

This is for specification convenience only.

7.1 Primitive interface

BCC ASE provides a set of services to its user, these are described in Table 7-1. This subclause describes the procedures internal to the BCC ASE that provide the services to its user.

Table 7-1/Q.2764 – Primitives between SACF and BCC ASE

Primitive name	Types
Link_Set_Up	Request/Indication
Link_Accepted	Request/Indication
Link_Rejected	Request/Indication
Link_Information	Request/Indication
Link_Release	Request/Indication/Response/Confirmation
Link_Resource_Management	Request/Indication
Link_Error	Indication
Link_Modify	Request/Indication/Response/Confirmation
Link_Modify_Rejected	Request/Indication

Tables 7-2 to 7-11 (see 7.4) list the contents for these primitives for the setup and release of basic call/connections.

BCC ASE uses the SACF service primitives: Transfer request/indication.

7.2 Outgoing BCC ASE

This subclause describes the protocol procedures performed on the outgoing side of an exchange when a connection is set up from an exchange to an adjacent exchange.

7.2.1 Bearer connection setup

7.2.1.1 Normal procedures

a) Outgoing BCC ASE procedures commence when a Link_Set_Up request primitive is received. The following actions then take place:
   - The parameters received in the Link_Set_Up request primitive are sent to SACF in the Transfer request primitive for passing to the succeeding exchange in an Initial Address message.
   - Timer "Await IAM Acknowledge" is started to await the Initial Address Acknowledgement message or Initial Address Reject message.

b) Subsequently:

- If an Initial Address Acknowledgement message is received in a Transfer indication primitive, the setup of the bearer connection to the succeeding exchange is considered to be successfully completed, and timer "Await IAM Acknowledge" is stopped. The contents of the Initial Address Acknowledgement message is passed on in a Link_Accepted indication primitive.
- Alternatively if an Initial Address Reject message is received in a Transfer indication primitive as the first backward message, the connection attempt is considered to have failed. Timer "Await IAM Acknowledge" is stopped. The contents of the Initial Address Reject message is passed on in a Link_Rejected indication primitive.

c) At any time after the issuing of a Link_Accepted indication:

- A Transfer indication primitive can be received containing a Network Resource Management message. This is passed on as a Link_Resource_Management indication primitive.
- A Link_Resource_Management request primitive can be received. This is passed on as a Network Resource Management message in a Transfer request primitive.
- A Transfer indication primitive can be received containing parameters from an Address Complete, Call Progress, or Answer message. This is passed on as a Link_Information indication primitive.
- A Link_Information request primitive can be received. The contents of this primitive are passed to SACF in a Transfer request primitive. (National option – Segmentation of the Initial Address Message.)

7.2.1.2 Exceptional procedures

7.2.1.2.1 Handling of unexpected primitives

Abnormal primitive sequences are dealt with as described in the SDL diagrams, see 7.5. If a protocol error is detected that requires an action to be performed on the call/connection, e.g. release, a Link_Error indication primitive is issued, the appropriate actions are then initiated by the Application Process.

7.2.1.2.2 Handling of timer expiries

If timer "Await IAM Acknowledge" expires the connection attempt is considered to have failed:

a) This event is reported using a Link_Error indication primitive. Cause #111 "Protocol Error, unspecified" is included.

b) Management is informed.

7.2.2 Bearer connection release

The outgoing BCC ASE initiates forward release of a bearer connection when a Link_Release request primitive is received, e.g. as a result of a request from the calling user.

Outgoing BCC ASE can also receive a Release message from SACF in a Transfer indication primitive, e.g. as a result of a request from the called user.

7.2.2.1 Normal procedures

7.2.2.1.1 Forward release

Outgoing BCC ASE can initiate forward release of a bearer connection at any time between the reception of an Initial Address Acknowledgement message, i.e. the issuing of a Link_Accepted indication primitive, and the receipt of a backward Release message.

a) When a Link_Release request primitive is received:

- A Release message is sent to SACF in a Transfer request primitive, for sending to the succeeding exchange.
- Timer "Await Release Complete" is started to ensure that a Release Complete message is received.

b) When the Release Complete message is received:

- Timer "Await Release Complete" is stopped.
- A Link_Release confirmation primitive is sent.

7.2.2.1.2 Backward release

Outgoing BCC ASE can receive a Release message, from SACF in a Transfer indication primitive, at any time between the reception of an Initial Address Acknowledgement message and the sending of a Release Complete message. The received Release message is passed on as a Link_Release indication primitive.

When the connection is released, a Link_Release response primitive will be received. A Release Complete message is sent to SACF in a Transfer request primitive, and thus to the succeeding exchange.

7.2.2.2 Exceptional procedures

7.2.2.2.1 Handling of unexpected primitives

Abnormal primitive sequences are dealt with as described in the SDL diagrams, see 7.5. If a protocol error is detected that requires an action to be performed on the call/connection, e.g. release, a Link_Error indication primitive is issued, the appropriate actions are then initiated by the Application Process.

In particular:

– *Collision of Release primitives*

If a Release message has been sent, and a Release message is received before the expected Release Complete message, a Link_Release indication is sent. Timer "Await Release Complete" continues to assure the reception of the Release Complete message.

When the Release Complete message is received, Timer "Await Release Complete" is stopped.

When the connection has been released a Link_Release response primitive will be received, a Release Complete message is then sent to SACF in a Transfer request primitive.

7.2.2.2.2 Handling of timer expiries

If timer "Await Release Complete" expires Management is informed, and a Link_Error indication primitive is issued.

7.2.3 Bearer connection modification procedures

7.2.3.1 Normal procedures

a) Outgoing BCC ASE procedures commence when a Link_Modify request primitive is received. The following actions then take place:

- The parameters received in the Link_Modify request primitive are sent to SACF in the Transfer request primitive for passing to the succeeding exchange in a Modify Request message.
- The following exchange types, as indicated in the value of the Exchange type parameter in the Modify request primitive, run timer "Await Modify Acknowledge":

- Initiating exchange.
- Outgoing international exchange.
- Intermediate international exchange.
- Incoming international exchange.

• Timer "Await Modify Acknowledge" is started when a Link_Modify request is received.

b) Subsequently:

• If a Modify Acknowledgment message is received in a Transfer indication primitive, timer "Await Modify Acknowledge" is stopped. The contents of the Modify Acknowledgment message are passed on in a Link_Modify confirmation primitive.

• Alternatively if a Modify Reject message is received in a Transfer indication primitive as the first backward message, the re-assignment attempt is considered to have failed. Timer "Await Modify Acknowledge" is stopped. The contents of the Modify Reject message are passed on in a Link_Modify_Rejected indication primitive.

• Other primitives are controlled as described in the SDL diagrams, see 7.5.

7.2.3.2 Exceptional procedures

7.2.3.2.1 Handling of unexpected primitives

Abnormal primitive sequences are dealt with as described in the SDL diagrams, see 7.5. If a protocol error is detected that requires an action to be performed on the call/connection (e.g. release), a Link_Error indication primitive is issued, the appropriate actions are then initiated by the Application Process.

7.2.3.2.2 Handling of timer expiry

If timer "Await Modify Acknowledge" expires, the modification procedure is considered to have failed:

a) This event is reported using a Link_Error indication primitive. Cause #111 "Protocol error, unspecified" is included.

b) Management is informed.

7.3 Incoming BCC ASE

7.3.1 Bearer connection setup

7.3.1.1 Normal procedures

When an Initial Address message is received, in a Transfer indication primitive, it is passed on in a Link_Set_Up Indication primitive. A Link_Accepted request or Link_Rejected request primitive will be received in response, which indicates success, or failure, to accept this incoming connection request.

If the response indicates success, an Initial Address Acknowledge message is sent in a Transfer request primitive.

If the response indicates failure, incoming bearer setup is terminated and an Initial Address Reject message is sent in a Transfer request primitive.

At any time after the reception of a Link_Accepted request:

• A Transfer indication primitive can be received containing a Network Resource Management message. This is passed on as a Link_Resource_Management indication primitive.

- A Link_Resource_Management request primitive can be received. This is passed on as a Network Resource Management message in a Transfer request primitive.
- A Link_Information request primitive can be received. The parameters in this primitive are returned in a Transfer request primitive.
- A Transfer indication primitive can be received containing parameter(s) from the Segmentation message. These parameters are passed on in a Link_Information indication primitive (national option).

7.3.1.2 Exceptional procedures

7.3.1.2.1 Handling of unexpected primitives

Abnormal primitive sequences are dealt with as described in the SDL diagrams, see 7.5. If a protocol error is detected that requires an action to be performed on the call/connection, e.g. release, a Link_Error indication primitive is issued, the appropriate actions are then initiated by the Application Process.

7.3.1.2.2 Handling of timer expiries

Not applicable.

7.3.2 Bearer connection release

The Incoming BCC ASE initiates backward release of a bearer connection when a Link_Release request primitive is received, e.g. as a result of a request from the called user.

Incoming BCC ASE can also receive a forward Release message, e.g. as a result of a request from the calling user.

7.3.2.1 Normal procedures

7.3.2.1.1 Forward release

Incoming BCC ASE can receive a Release message, from SACF in a Transfer indication primitive, at any time between the sending of an Initial Address Acknowledgement message and the sending of a backward Release Complete message. The received Release is passed to SACF as a Link_Release Indication primitive.

When the connection is released a Link_Release Response primitive will be received, and a Release Complete message is sent to SACF in a Transfer request primitive, and thus to the preceding exchange.

7.3.2.1.2 Backward release

Incoming BCC ASE initiates backward release of a bearer connection when a Link_Release request primitive is received, at any time between the sending of an Initial Address Acknowledgement message and the receipt of a forward Release message.

a) When a Link_Release request primitive is received:
   - A Release message is sent to SACF in a Transfer request primitive, for sending to the preceding exchange.
   - Timer "Await Release Complete" is started to ensure that a Release Complete message is received.

b) When the Release Complete message is received in a Transfer indication primitive:
   - Timer "Await Release Complete" is stopped.
   - A Link_Release confirmation primitive is sent.

7.3.2.2 Exceptional procedures

7.3.2.2.1 Handling of unexpected primitives

Abnormal primitive sequences are dealt with as described in the SDL diagrams, see 7.5. If a protocol error is detected that requires an action to be performed on the call/connection, e.g. release, a Link_Error indication primitive is issued, the appropriate actions are then initiated by the Application Process.

7.3.2.2.2 Handling of timer expiries

As in 7.2.2.2.2.

7.3.3 Bearer connection modification

7.3.3.1 Normal procedures

a) Incoming BCC ASE procedures commence when a Modify Request message is received in a Transfer indication primitive. The following actions then take place:

- The contents of the Modify Request message are passed on in a Link_Modify indication primitive.

b) Subsequently:

- The parameters received in the Link_Modify response primitive are sent to SACF in the Transfer request primitive for passing to the preceding exchange in a Modify Acknowledge message.
- Alternatively the parameters received in the Link_Modify_Rejected request primitive are sent to SACF in the Transfer request primitive for passing to the preceding exchange in a Modify Reject message.
- Other primitives are controlled as described in the SDL diagrams, see 7.5.

7.3.3.2 Exceptional procedures

7.3.3.2.1 Handling of unexpected primitives

Abnormal primitive sequences are dealt with as described in the SDL diagrams, see 7.5. If a protocol error is detected that requires an action to be performed on the call/connection, e.g. release, a Link_Error indication primitive is issued, the appropriate actions are then initiated by the Application Process.

7.3.3.2.2 Handling of timer expiry

Not applicable.

7.4 Primitive contents

Tables 7-2 to 7-11 list the contents for the BCC ASE service primitives.

Table 7-2/Q.2764 – Parameters for Link_Set_Up Request/Indication primitive

Message Compatibility Information
Additional ATM cell rate
Alternative ATM cell rate
AAL Parameters
AAL prime parameters
ATC setup parameters
ATM Cell Rate
Broadband Low Layer Information
CDVT
Broadband Bearer Capability
Connection Element Identifier
Echo Control Information
End-to-end transit delay network generated indicator
Exclusive Connection Element Identifier
Extended Quality of Service parameter
Maximum End-to-End Transit Delay
Minimum ATM cell rate
Narrow-band Bearer Capability
Narrow-band Low Layer Compatibility
OAM Traffic Descriptor
Propagation Delay Counter
Quality of Service

Table 7-3/Q.2764 – Parameters for Link_Accepted Request/Indication primitive

Message Compatibility Information
Connection Element Identifier

Table 7-4/Q.2764 – Parameters for Link_Rejected Request/Indication primitive

Message Compatibility Information
Cause

Table 7-5/Q.2764 – Parameters for Link_Information Request/Indication primitive

Message Compatibility Information
Additional ATM cell rate
AAL Parameters
AAL prime parameters
ATC setup parameters
ATM cell rate
CDVT
Echo Control Information
Broadband Low layer Information
Call History Information
Extended Quality of Service
Narrow-band Low Layer Compatibility
Narrow-band Bearer Capability
OAM Traffic Descriptor

Table 7-6/Q.2764 – Parameters for Link_Release Request/Indication primitive

Message Compatibility Information
Cause

Table 7-7/Q.2764 – Parameters for Link_Release Response/Confirmation primitive

Message Compatibility Information
Cause

Table 7-8/Q.2764 – Parameters for Link_Resource_Management Request/Indication primitive

Message Compatibility Information
Echo Control Information

Table 7-9/Q.2764 – Parameters for Link_Modify Request/Indication primitive

Message Compatibility Information
ATM Cell Rate
Additional ATM cell rate
Alternative ATM Cell Rate
Minimum ATM Cell Rate
Notification
Exchange Type (Note)
NOTE – The exchange type parameter takes the appropriate value from the list in 1.1. It is passed to the ASE so that the protocol can be varied depending on the role that the exchange is performing for this call/connection. Unlike the other parameters, it does not relate to a protocol information element. This parameter is only present in the request primitive.

Table 7-10/Q.2764 – Parameters for Link_Modify Response/Confirmation primitive

Message Compatibility Information
ATM Cell Rate
Additional ATM Cell Rate
Notification
Report type

Table 7-11/Q.2764 – Parameters for Link_Modify_Rejected Request/Indication primitive

Message Compatibility Information
Notification
Cause Indicators

7.5 SDL diagrams

If any difference is found between the procedures described in these SDLs and the procedures described in the text, the text shall take precedence. (See Figures 7-1 and 7-2.)

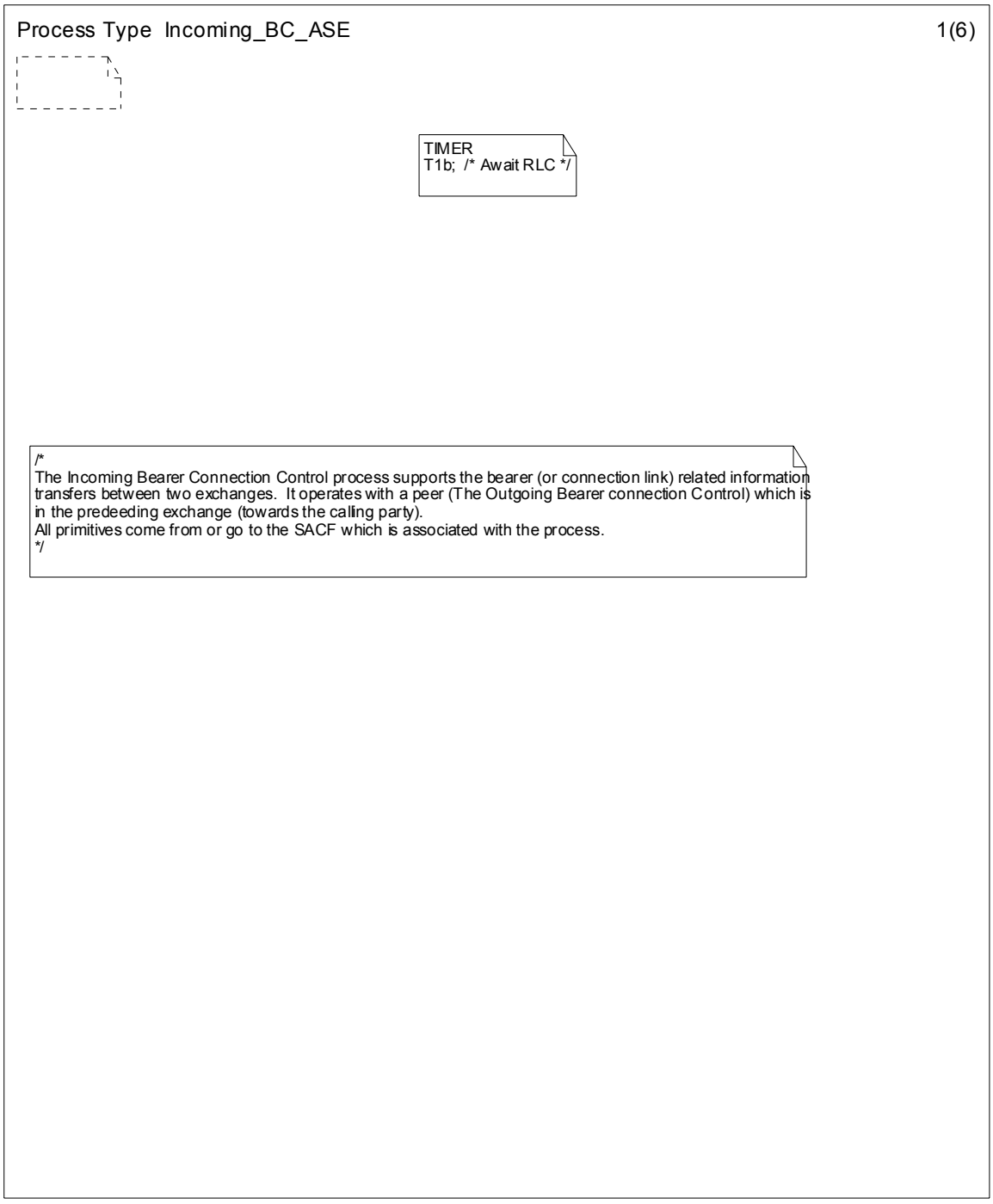

Figure 7-1/Q.2764 ***(sheet 1 of 6)***

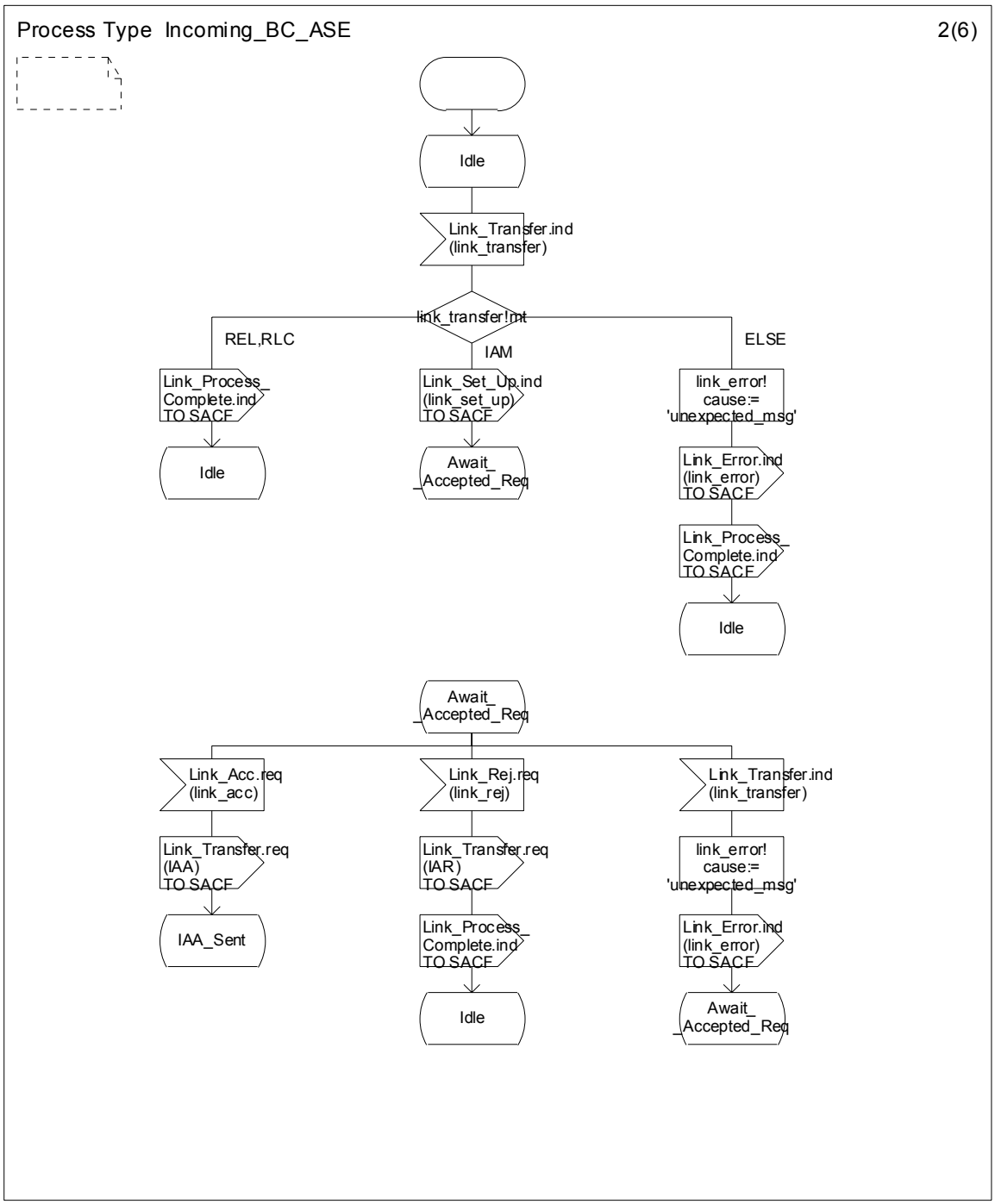

Figure 7-1/Q.2764 ***(sheet 2 of 6)***

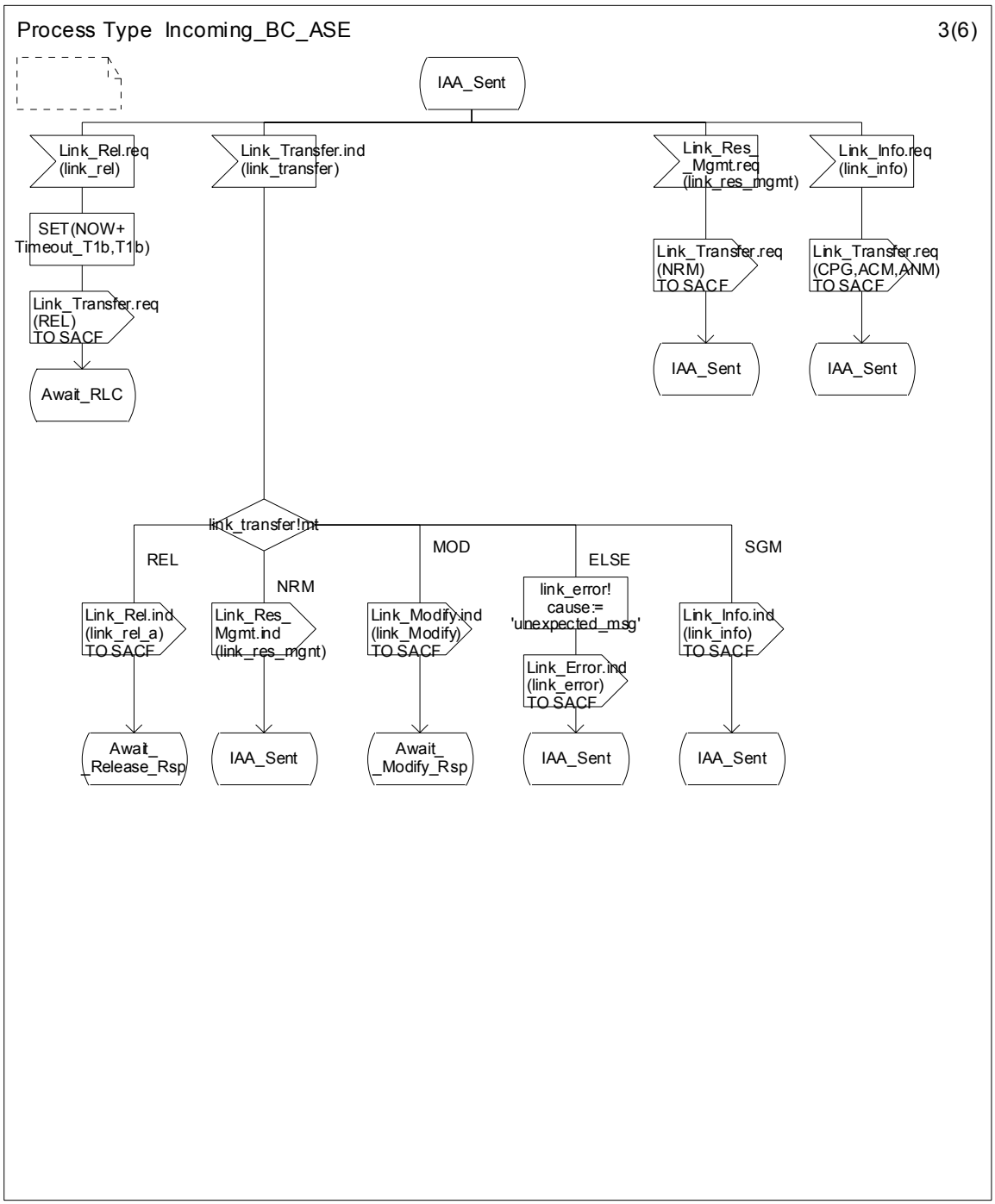

Figure 7-1/Q.2764 ***(sheet 3 of 6)***

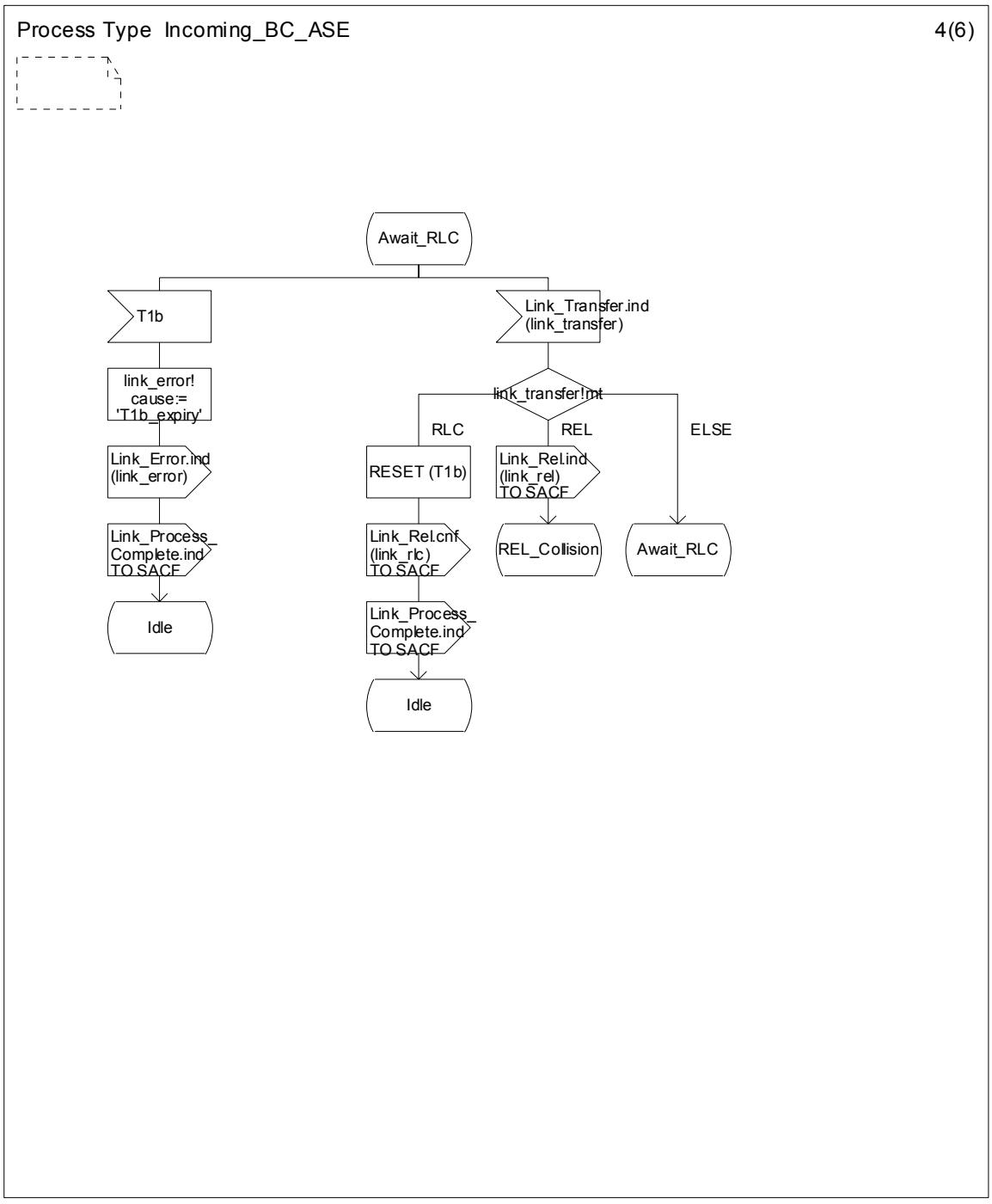

Figure 7-1/Q.2764 ***(sheet 4 of 6)***

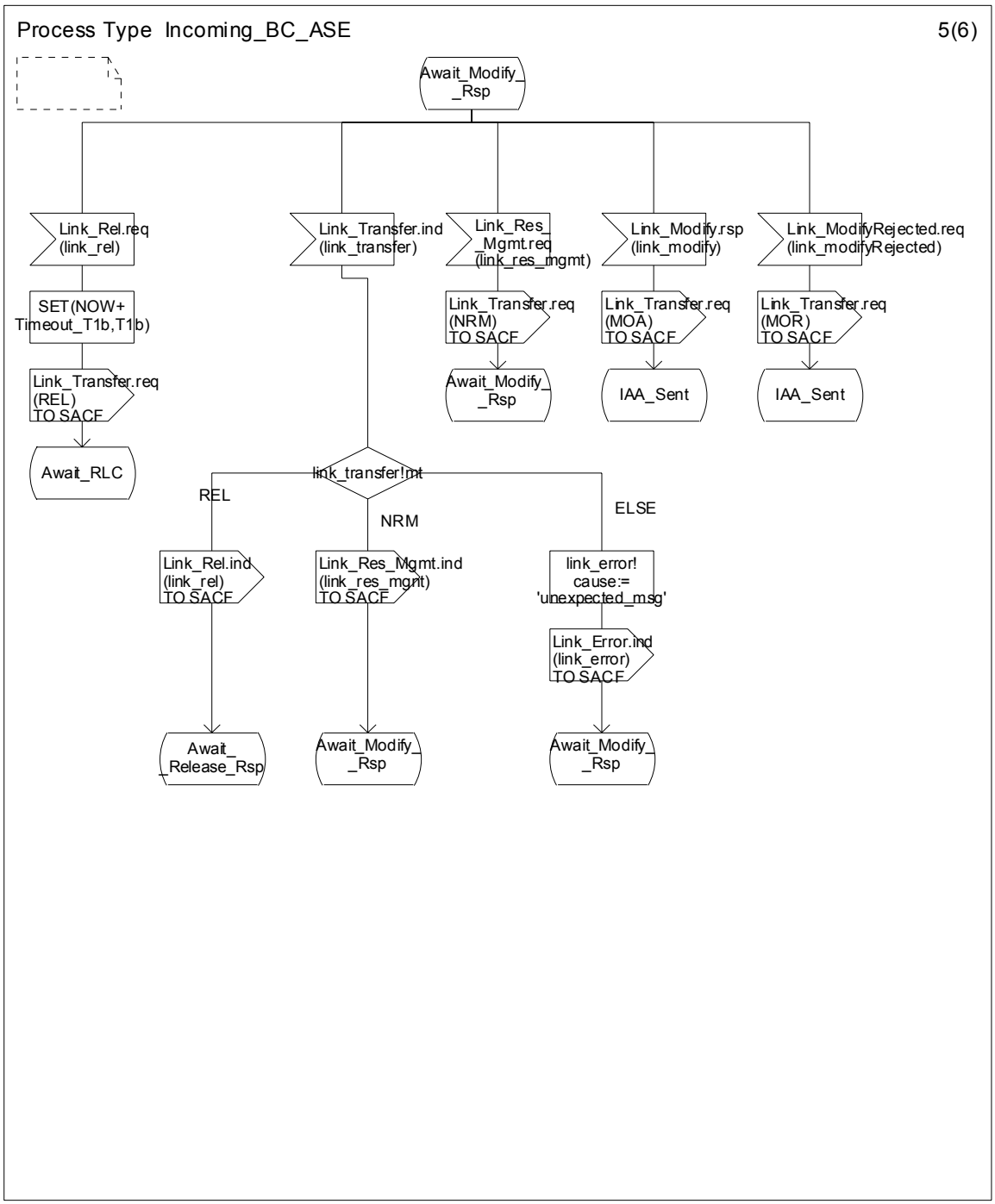

Figure 7-1/Q.2764 ***(sheet 5 of 6)***

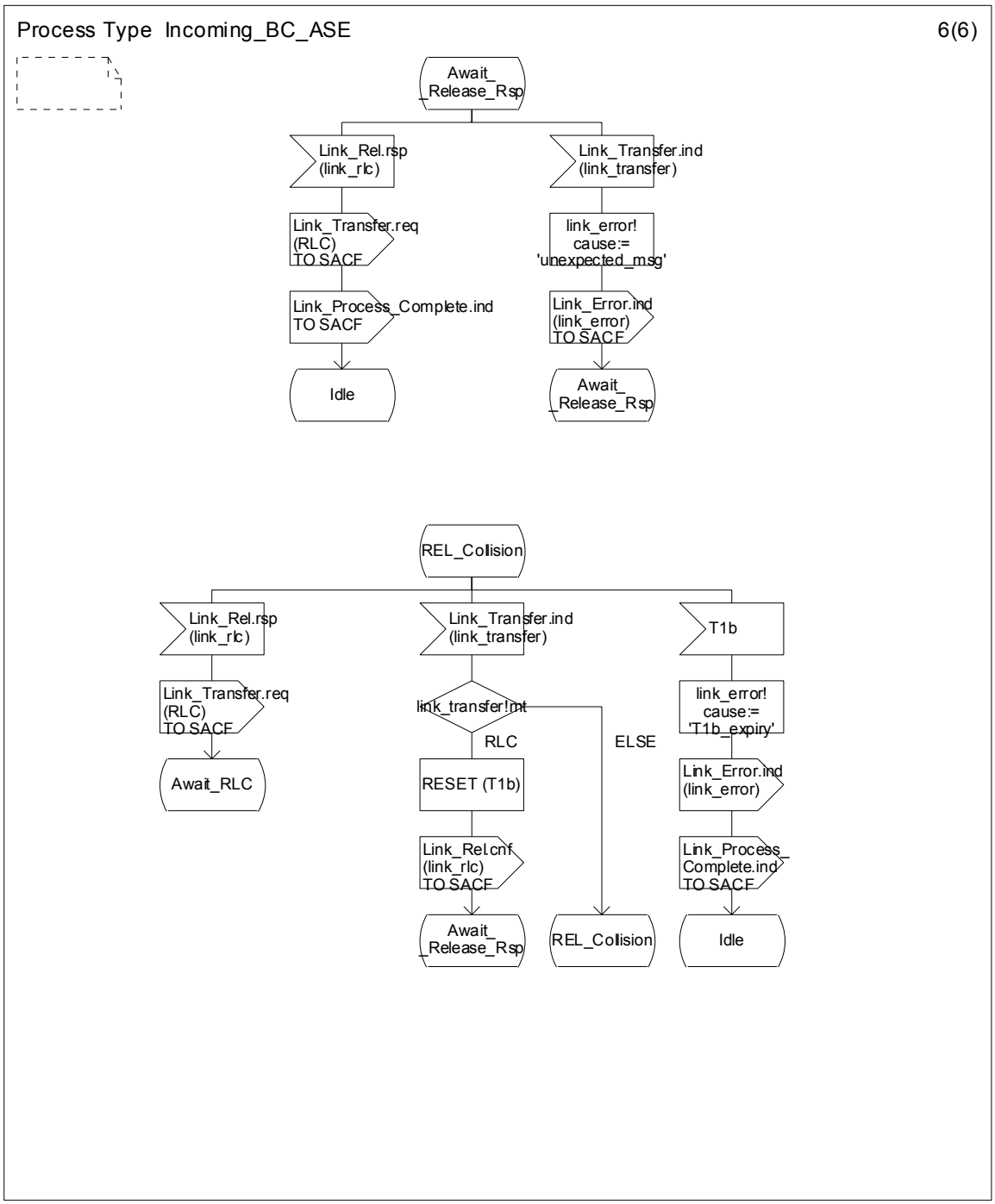

Figure 7-1/Q.2764 ***(sheet 6 of 6)***

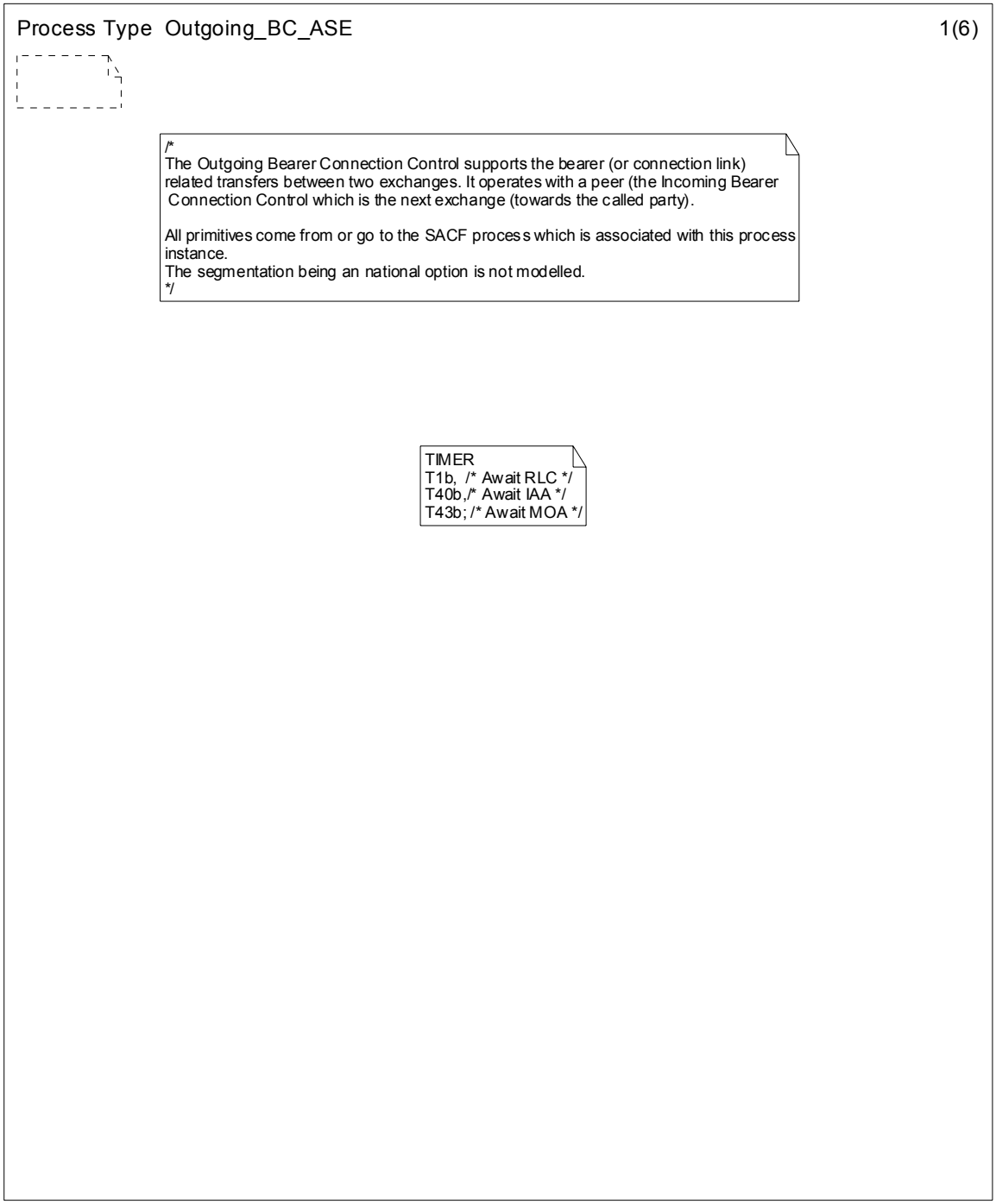

Figure 7-2/Q.2764 ***(sheet 1 of 6)***

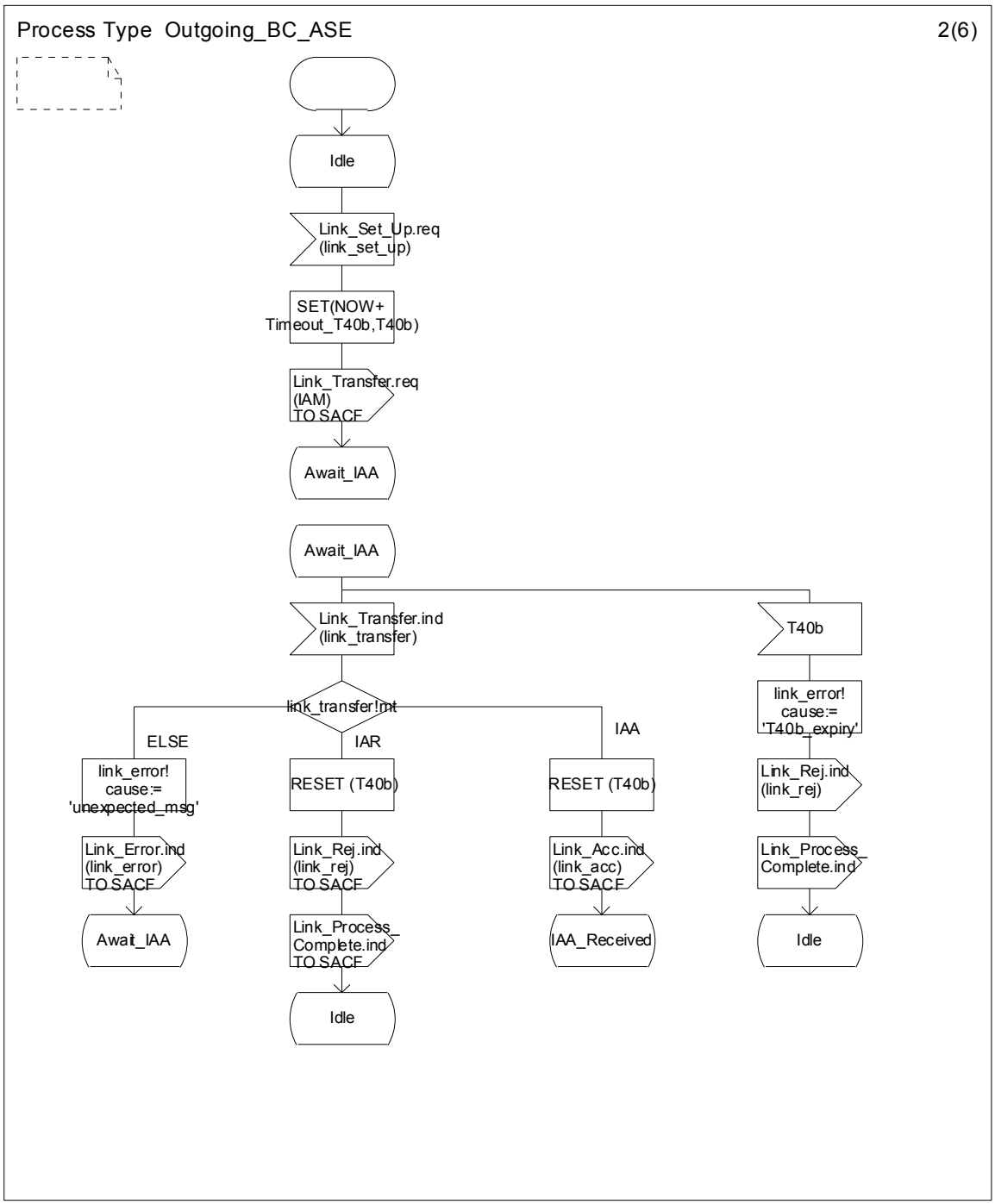

Figure 7-2/Q.2764 ***(sheet 2 of 6)***

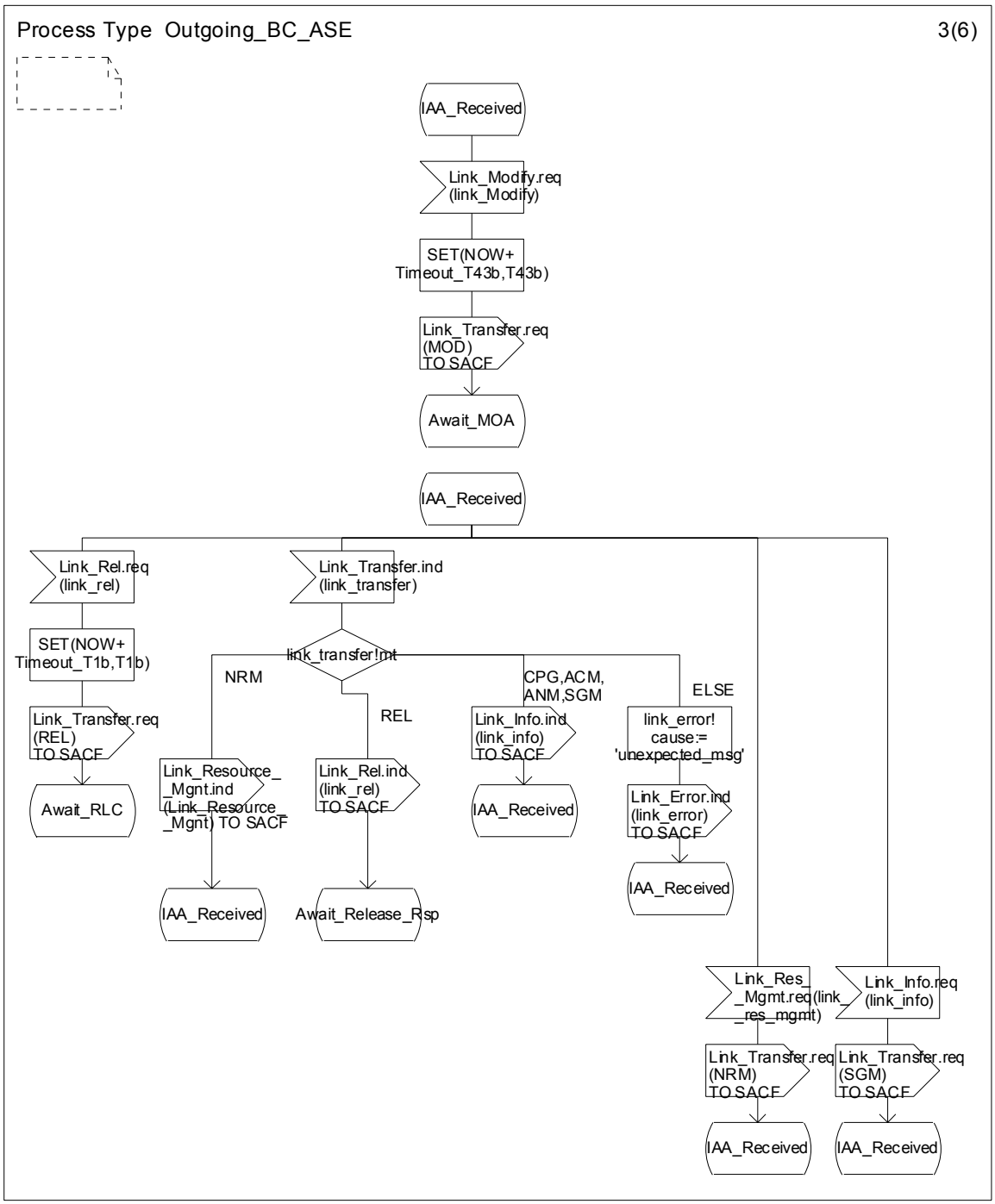

Figure 7-2/Q.2764 ***(sheet 3 of 6)***

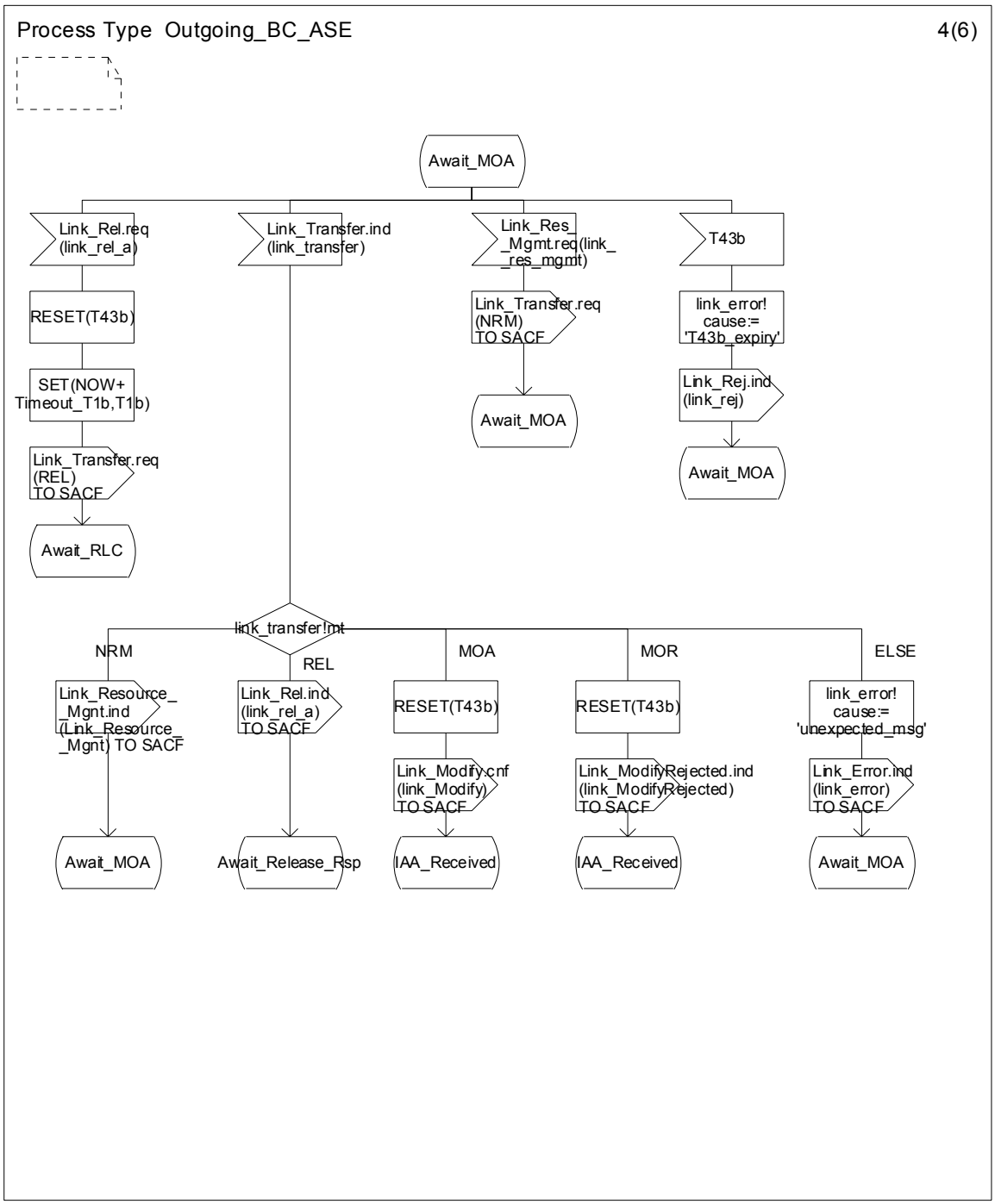

Figure 7-2/Q.2764 ***(sheet 4 of 6)***

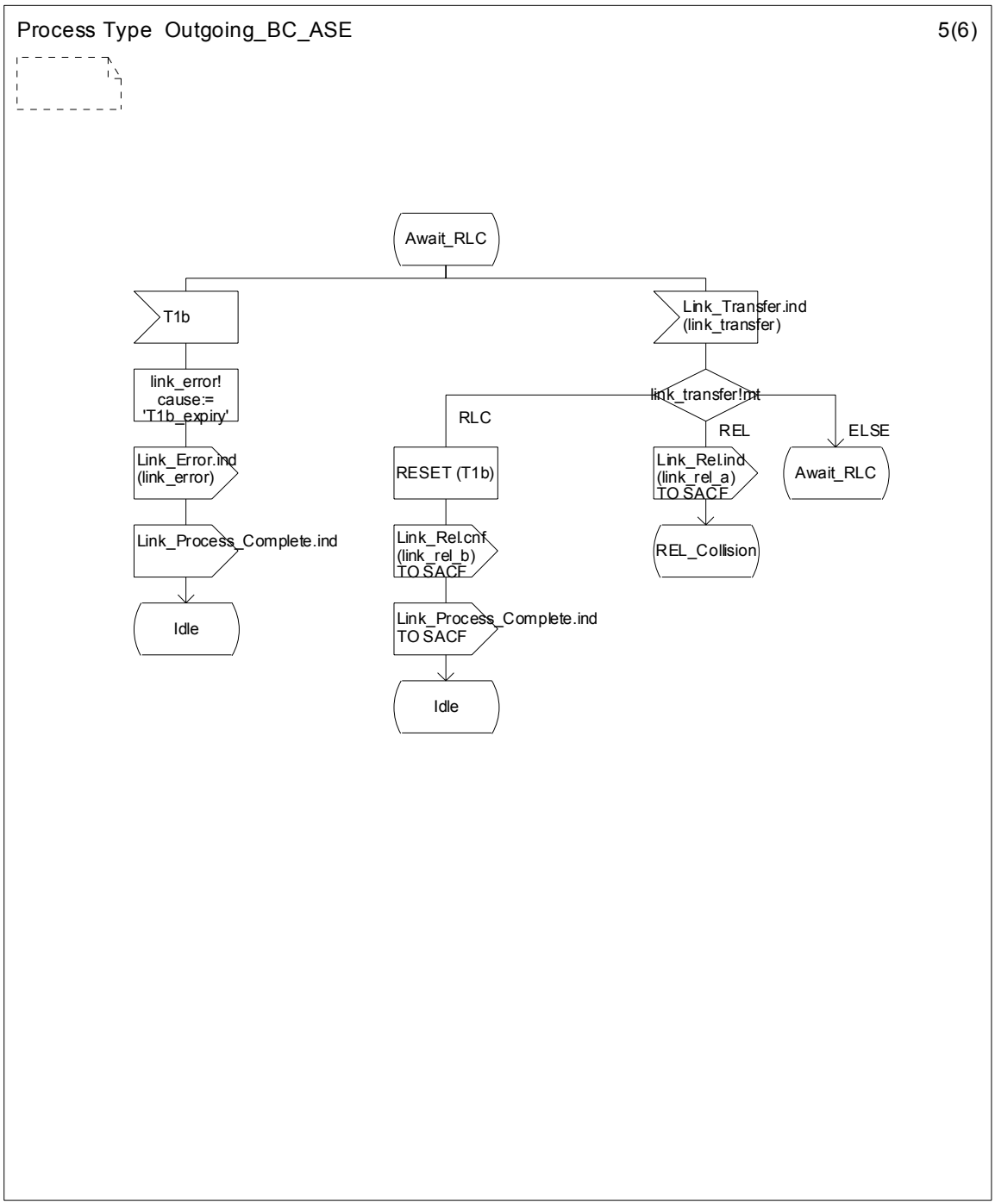

Figure 7-2/Q.2764 ***(sheet 5 of 6)***

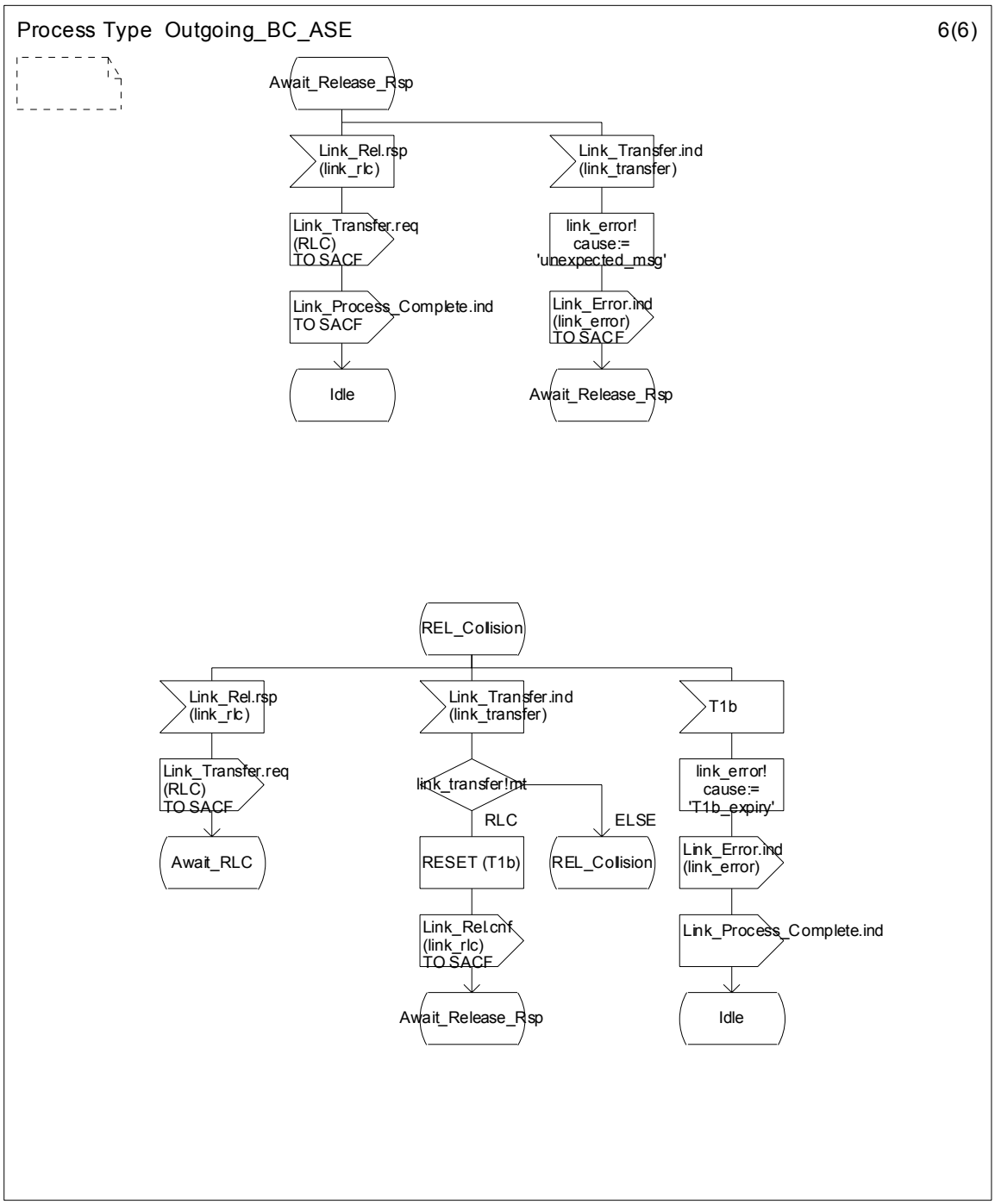

Figure 7-2/Q.2764 ***(sheet 6 of 6)***

8 Call Control ASE (CC ASE)

8.1 Primitive interface

CC ASE provides a set of services to its user, these are listed in Table 8-1. This subclause describes the procedures internal to the CC ASE that provide the services to its user.

CC ASE procedures are described in two parts:

- Outgoing CC ASE; and
- Incoming CC ASE.

This is for specification convenience only.

Table 8-1/Q.2764 – Primitives between SACF and CC ASE

Primitive name	Types
Call_Set_Up	Request/Indication
Call_Address_Complete	Request/Indication
Call_Subsequent_Address	Request/Indication
Call_Release	Request/Indication
Call_Pre-Release_Info	Request/Indication
Call_Answer	Request/Indication
Call_Progress	Request/Indication
Call_Suspend	Request/Indication
Call_Resume	Request/Indication
Call_Forward_Transfer	Request/Indication
Call_Segment (national use)	Request/Indication
Call_Error	Indication
Call_Modify	Request/Indication
Call_Connection_Available	Request/Indication

Tables 8-3 to 8-14 (see 8.3) list the parameters for the service primitives on this interface.

CC ASE uses the SACF service primitives: Transfer request/indication.

8.2 Outgoing CC ASE

The protocol functions contained in Outgoing CC ASE consist of the following:

a) Checking the correct sequence of received messages: The SDL diagrams in 8.5 fully define the Outgoing CC ASE finite state machine. If a protocol error is detected that requires an action to be performed on the call, e.g. release, a Call_Error indication primitive is issued, the appropriate actions are then initiated by the Application Process.

b) Converting messages received in the User_data field of Transfer indication primitives into CC ASE service primitives. The mapping performed is listed in Table 8-2. (This mapping assumes that the events are received in the correct sequence as shown in the SDL diagrams.)

c) Transferring the information received in the CC ASE service primitives into the User_data field of Transfer primitives. The mapping performed is listed in Table 8-2. (This mapping assumes that the events are received in the correct sequence as shown in the SDL diagrams.)

d) Handling of timer "Await Address Complete":

   The following exchange types, as indicated in the value of the Exchange type parameter in the Call_Set_Up request primitive, run timer "Await Address Complete":

   - Originating exchange;
   - Outgoing international exchange;
   - Intermediate international exchange;
   - Incoming international exchange.

   Timer "Await Address Complete" is started when a Call_Set_Up request is received.

Timer "Await Address Complete" is restarted when a Call_Subsequent_Address request is received, when overlap addressing is being performed.

Timer "Await Address Complete" is stopped when a Call_Address_Complete or Call_Answer indication is issued.

If Timer "Await Address Complete" expires CC ASE issues a Call_Error indication primitive. (The Application Process will subsequently release the call.)

Table 8-2/Q.2764 – Outgoing CC ASE mapping between message types and service primitives

Interface c	Map	Message type
Call_Set_Up req.	⇒	Initial Address
Call_Address_Complete ind.	⇐	Address Complete
Call_Subsequent_Address req.	⇒	Subsequent Address
Call_Release req./ind.	⇔	Release
Call_Pre-Release_Info req./ind.	⇔	Pre-Release Information
Call_Answer ind.	⇐	Answer
Call_Progress ind.	⇐	Call Progress
Call_Suspend req./ind.	⇔	Suspend
Call_Resume req./ind.	⇔	Resume
Call_Forward_Transfer req.	⇒	Forward Transfer
Call_Segment req./ind.	⇔	Segmentation
Call_Modify req.	⇒	Modify Request
Call_Connection_Available req.	⇒	Connection Available

8.3 Incoming CC ASE

The protocol functions contained in Incoming CC ASE consist of the following:

a) Checking the correct sequence of received messages: The SDL diagrams in 8.5 fully define the Incoming CC ASE finite state machine. If a protocol error is detected that requires an action to be performed on the call, e.g. release, a Call_Error indication primitive is issued, the appropriate actions are then initiated by the Application Process.

b) Converting messages received in the User_data field of Transfer indication primitives into CC ASE service primitives. The mapping performed is listed in Table 8-3. (This mapping assumes that the events are received in the correct sequence as shown in the SDL diagrams.)

c) Transferring the information received in the CC ASE service primitives into the User_data field of Transfer primitives. The mapping performed is listed in Table 8-3. (This mapping assumes that the events are received in the correct sequence as shown in the SDL diagrams.)

Table 8-3/Q.2764 – Incoming CC ASE mapping between message types and service primitives

Interface c	Map	Message type
Call_Set_Up ind.	⇐	Initial Address
Call_Address_Complete req.	⇒	Address Complete
Call_Subsequent_Address ind.	⇐	Subsequent Address
Call_Release req./ind.	⇔	Release
Call_Pre-Release_Info req./ind.	⇔	Pre-Release Information
Call_Answer req.	⇒	Answer
Call_Progress req.	⇔	Call Progress
Call_Suspend req./ind.	⇔	Suspend
Call_Resume req./ind.	⇔	Resume
Call_Forward_Transfer ind.	⇐	Forward Transfer
Call_Segment req./ind.	⇔	Segmentation
Call_Modify ind.	⇐	Modify Request
Call_Connection_Available ind.	⇐	Connection Available

8.4 Primitive contents

Tables 8-4 to 8-15 list the contents for the CC ASE service primitives.

Table 8-4/Q.2764 – Parameters for Call_Set_Up Request/Indication primitive

Message Compatibility Information
AESA for Called Party
Automatic Re-routing
Broadband High Layer Information
Called Party Number
Calling Party's Category
Forward Narrow-band Interworking Indicator
Hop Counter
Location Number
Link layer core parameters
Link layer protocol parameters
Narrow-band High Layer Compatibility
National/international Call Indicator
Origination ISC Point Code
Progress Indicator
Report Type
Report Type Prime
Segmentation Indicator

Table 8-4/Q.2764 – Parameters for Call_Set_Up Request/Indication primitive *(concluded)*

Temporary Alternative Routing
Transit Network Selection
Exchange type (Note)
NOTE – The exchange type parameter takes the appropriate value from the list in 1.1. It is passed to the ASE so that the protocol can be varied depending on the role that the exchange is performing for this call/connection. Unlike the other parameters, it does not relate to a protocol information element. This parameter is only present in the request primitive.

Table 8-5/Q.2764 – Parameters for Call_Address_Complete Request/Indication primitive

Message Compatibility Information
Access Delivery
Backward Narrow-band Interworking Indicator
Called Party Indicators
Cause Indicators
Charge Indicator
In-band Information Indicator
Narrow-band High Layer Capability
Progress Indicator
Report Type
Segmentation Indicator

Table 8-6/Q.2764 – Parameters for Call_Subsequent_Address Request/Indication primitive

Message Compatibility Information
Subsequent Number

Table 8-7/Q.2764 – Parameters for Call_Release Request/Indication primitive

Message Compatibility Information
Access Delivery
Automatic Re-routing
Cause Indicator
Progress Indicator
Segmentation Indicator

Table 8-8/Q.2764 – Parameters for Call_Answer Request/Indication primitive

Message Compatibility Information
Access Delivery
Backward Narrow-band Interworking Indicator
Call History Information
Charge Indicator
In-band Information Indicator
Link layer core parameters
Link layer protocol parameters
Narrow-band High Layer Capability
Progress Indicator
Report Type
Report Type Prime
Segmentation Indicator

Table 8-9/Q.2764 – Parameters for Call_Progress Request/Indication primitive

Message Compatibility Information
Access Delivery
Backward Narrow-band Interworking Indicator
Called Party's Indicators
Cause Indicators
Charge Indicator
In-band Information Indicator
Narrow-band High Layer Capability
Progress Indicator
Report Type
Segmentation Indicator

Table 8-10/Q.2764 – Parameters for Call_Suspend Request/Indication and Call_Resume Request/Indication primitives

Message Compatibility Information
Suspend/Resume Indicators

Table 8-11/Q.2764 – Parameters for Call_Forward_Transfer Request/Indication primitive

Message Compatibility Information

Table 8-12/Q.2764 – Parameters for Call_Segment Request/Indication primitive

Message Compatibility Information
Broadband High Layer Information
Narrow-band High Layer Compatibility
Progress Indicator

Table 8-13/Q.2764 – Parameters for Call_Modify Request/Indication primitive

Message Compatibility Information

Table 8-14/Q.2764 – Parameters for Call_Connection_Available Request/Indication primitive

Message Compatibility Information
Notification
Report Type
NOTE – The former name of the primitive was Modify_Confirm primitive. Existing procedures are not influenced by this editorial change. However, this primitive may be used in additional procedure(s).

Table 8-15/Q.2764 – Parameters for Call_Pre-Release_Info Request/Indication primitive

Message Compatibility Information

8.5 SDL diagrams

If any difference is found between the procedures described in these SDLs and the procedures described in the text, the text shall take precedence. (See Figures 8-1 and 8-2.)

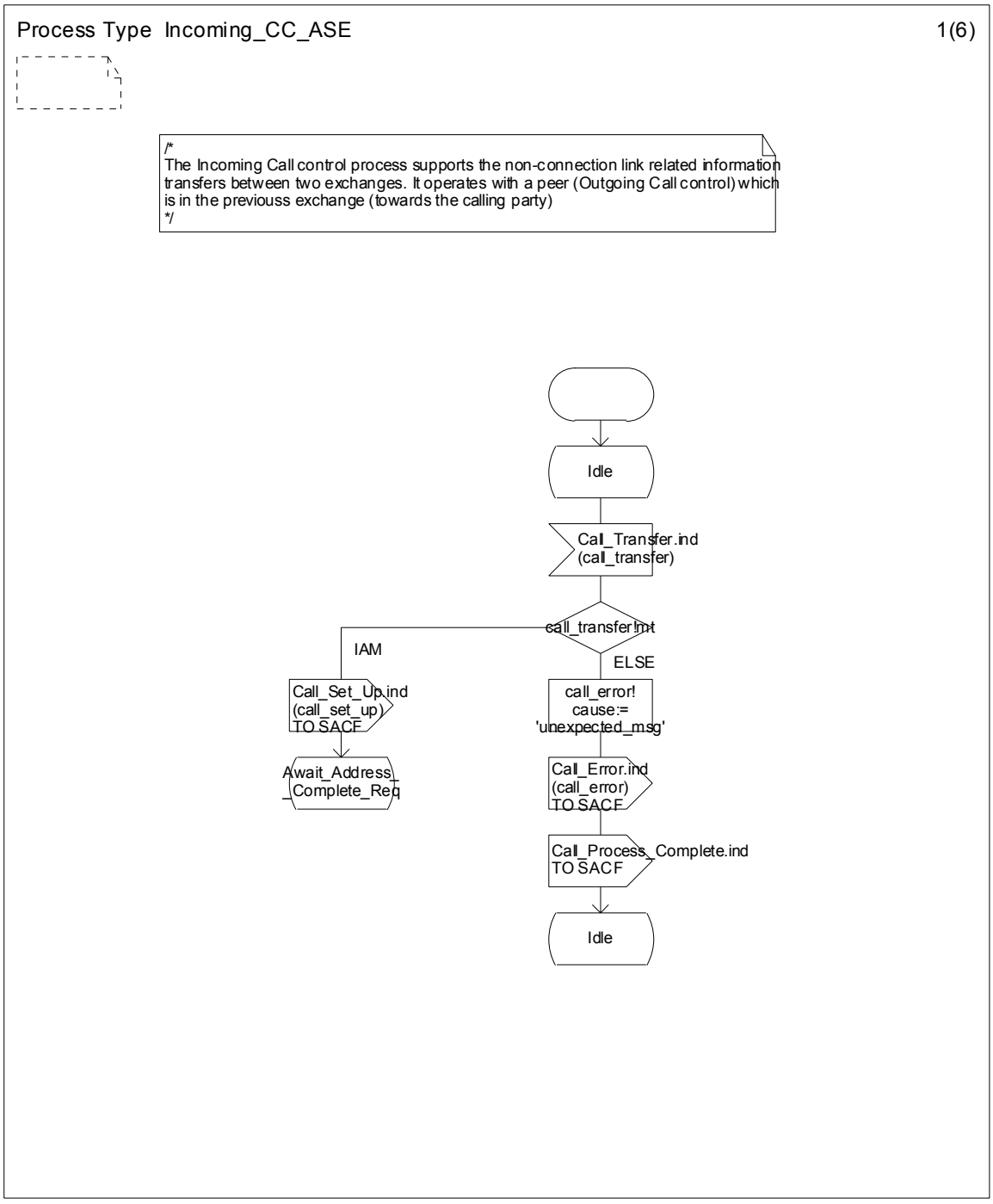

Figure 8-1/Q.2764 ***(sheet 1 of 6)***

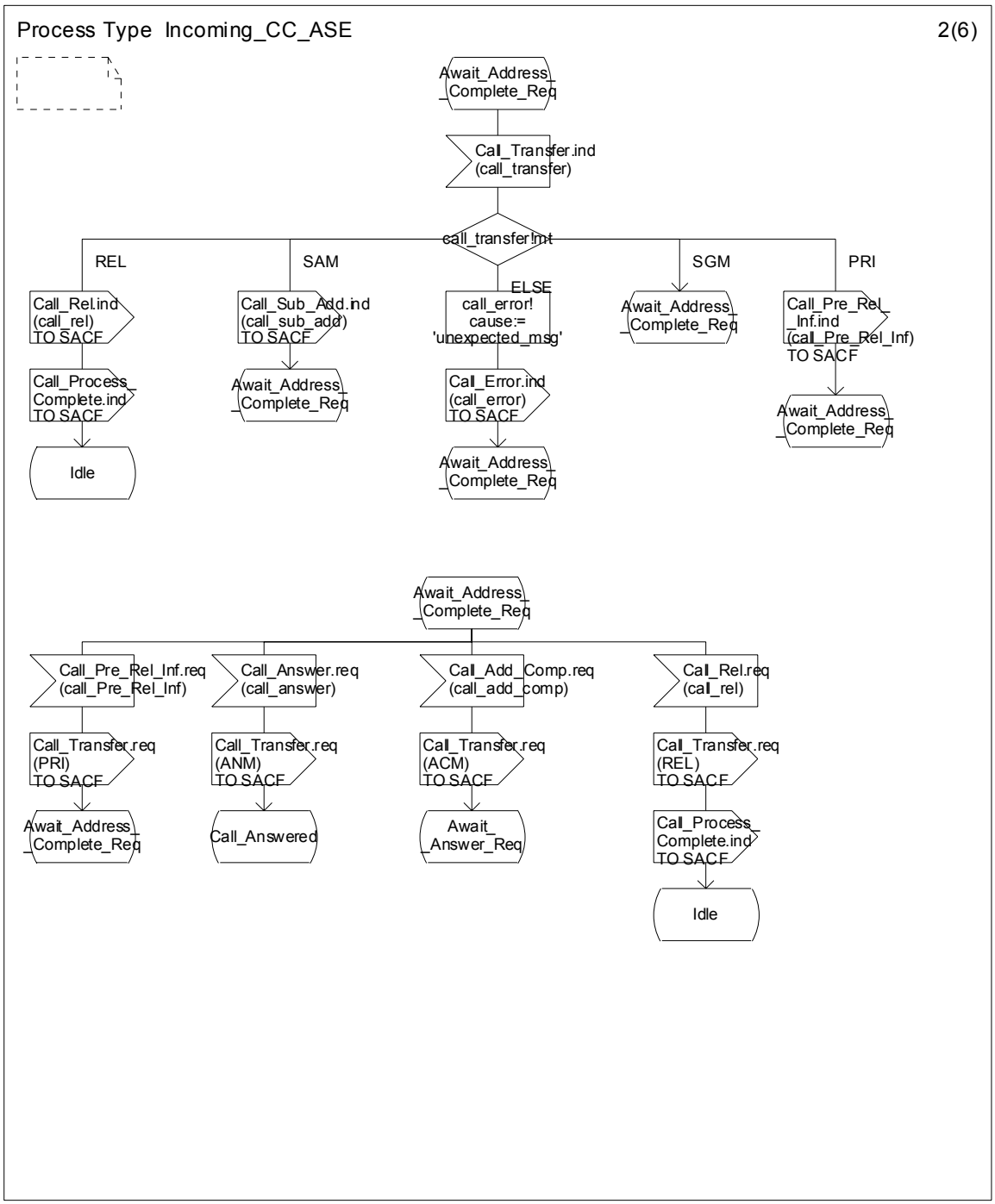

Figure 8-1/Q.2764 ***(sheet 2 of 6)***

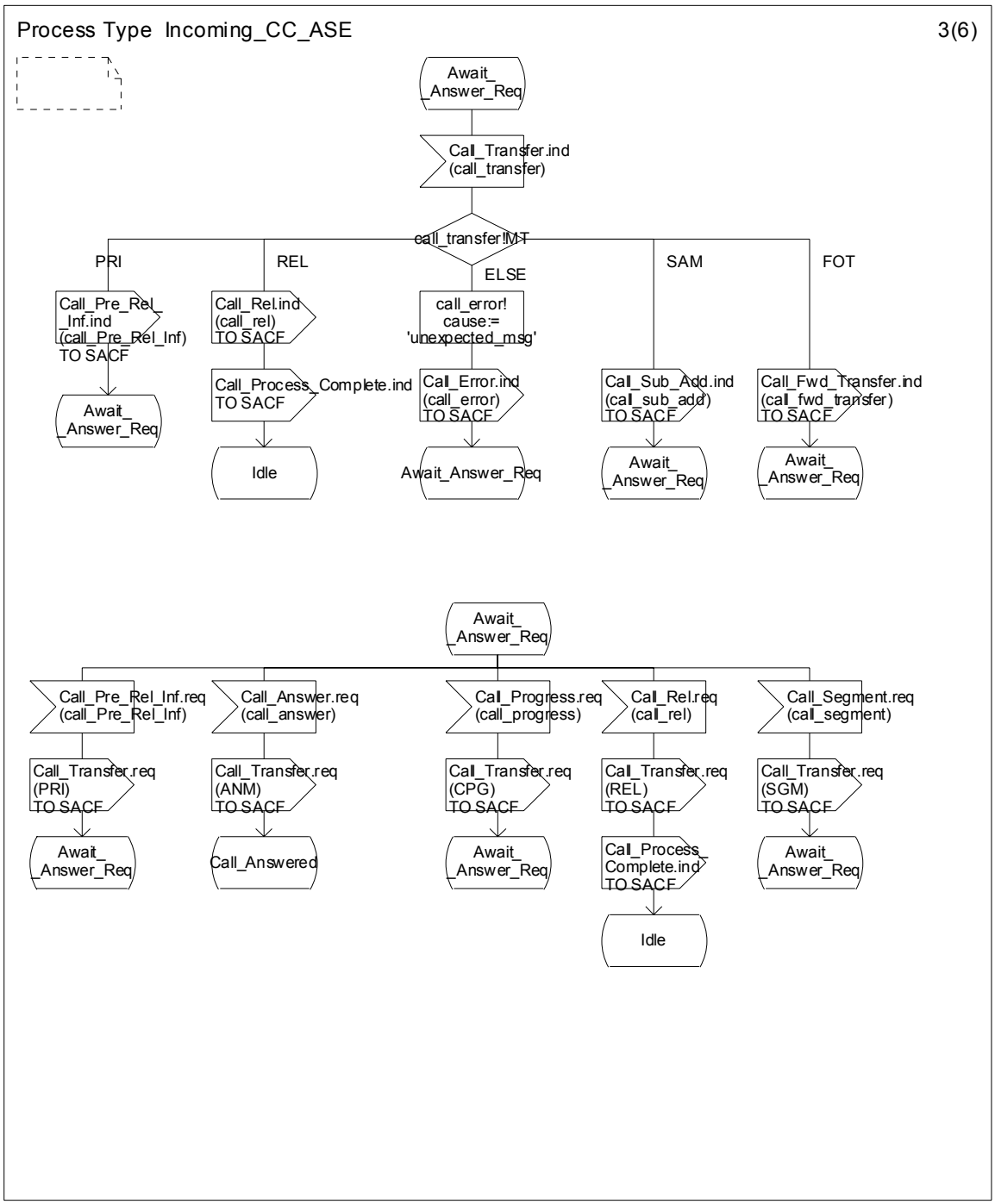

Figure 8-1/Q.2764 ***(sheet 3 of 6)***

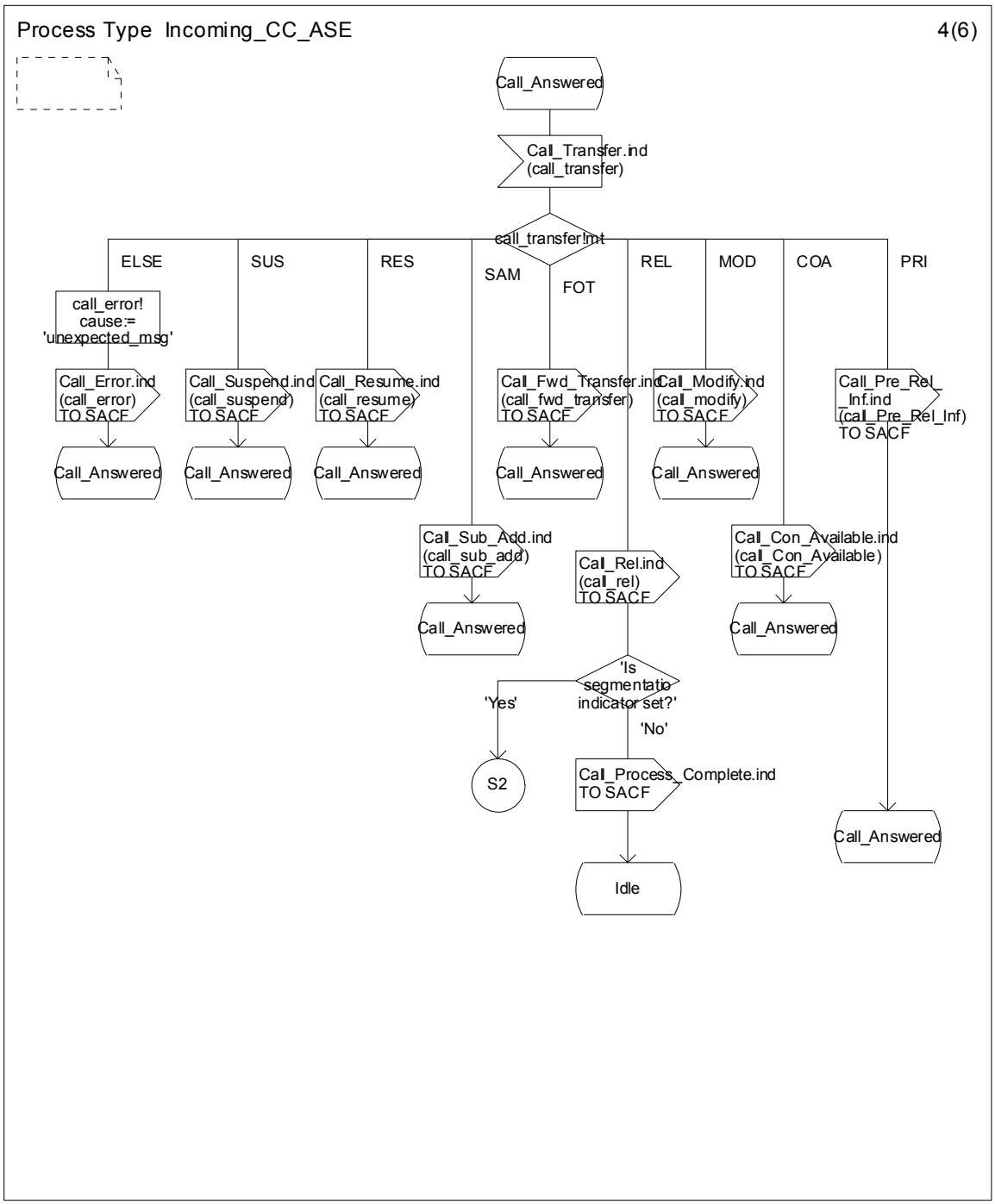

Figure 8-1/Q.2764 ***(sheet 4 of 6)***

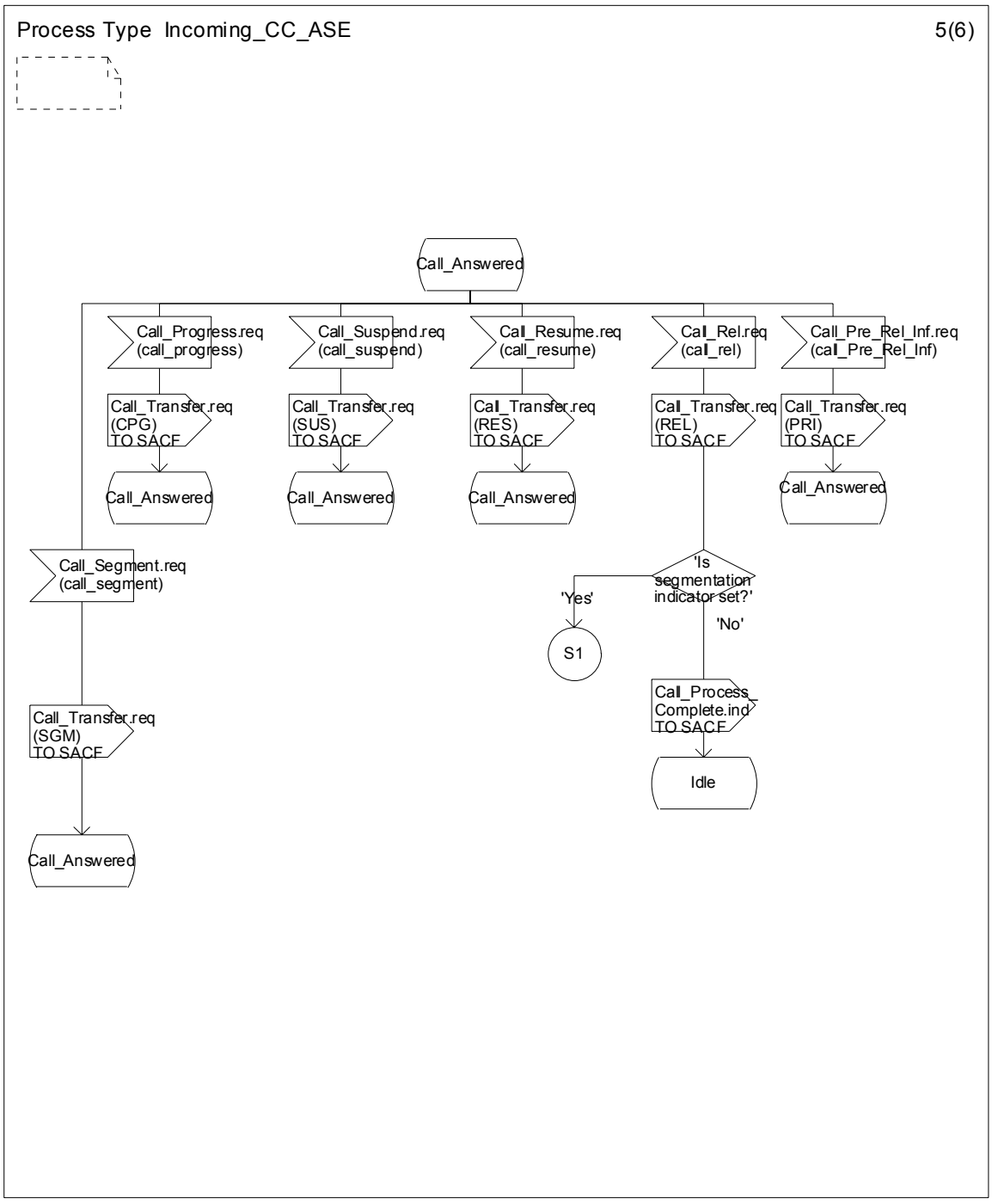

Figure 8-1/Q.2764 ***(sheet 5 of 6)***

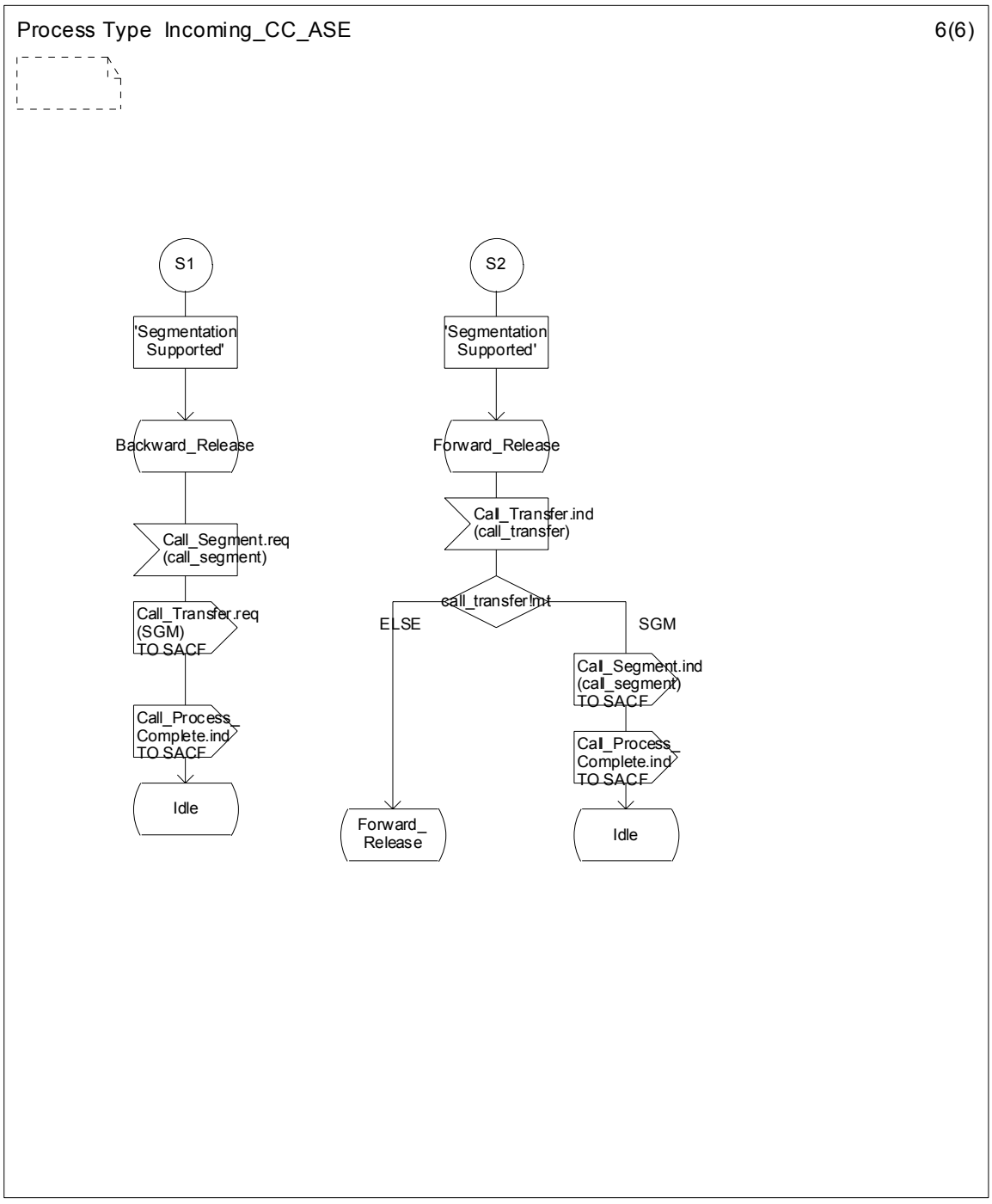

Figure 8-1/Q.2764 ***(sheet 6 of 6)***

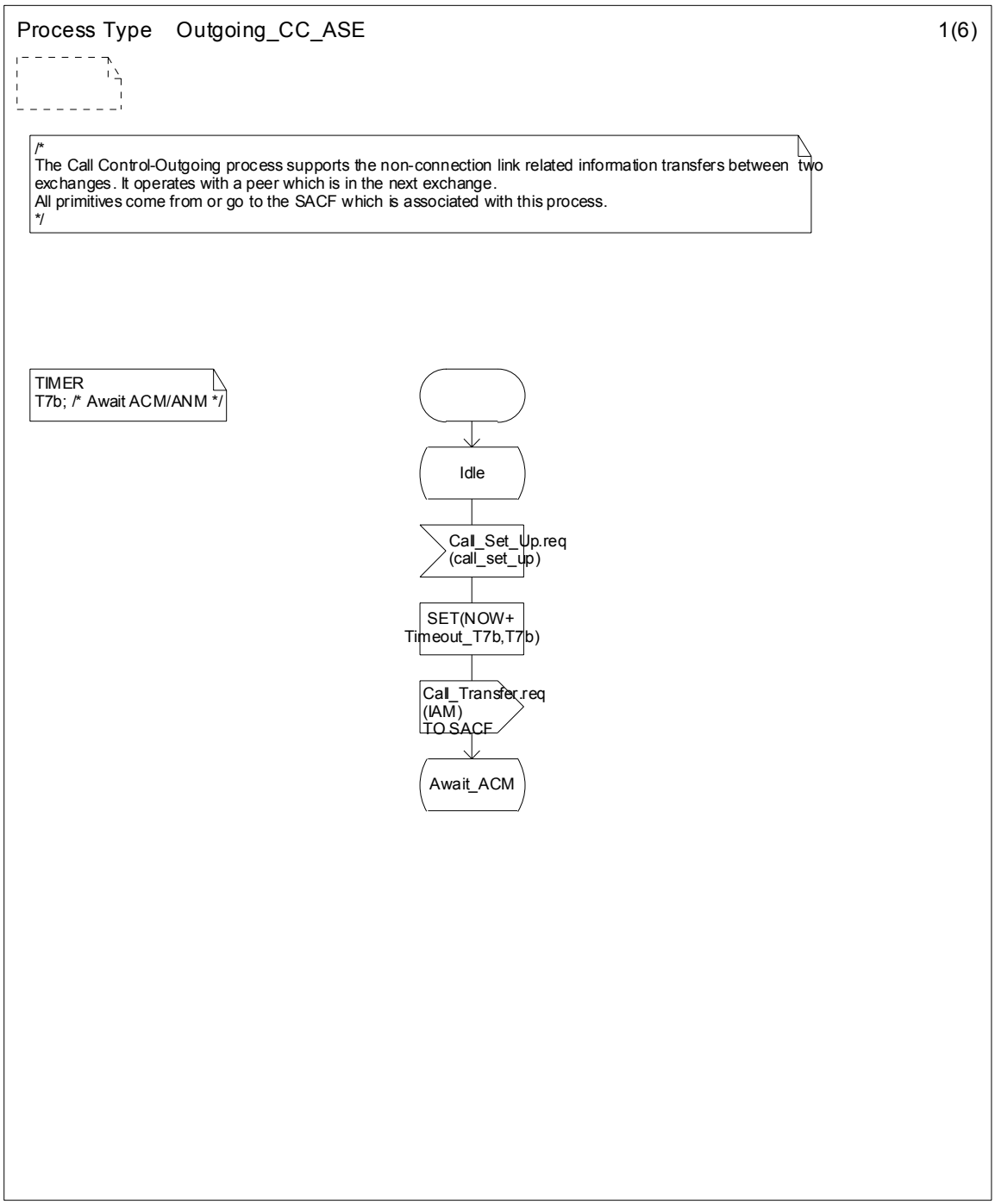

Figure 8-2/Q.2764 ***(sheet 1 of 6)***

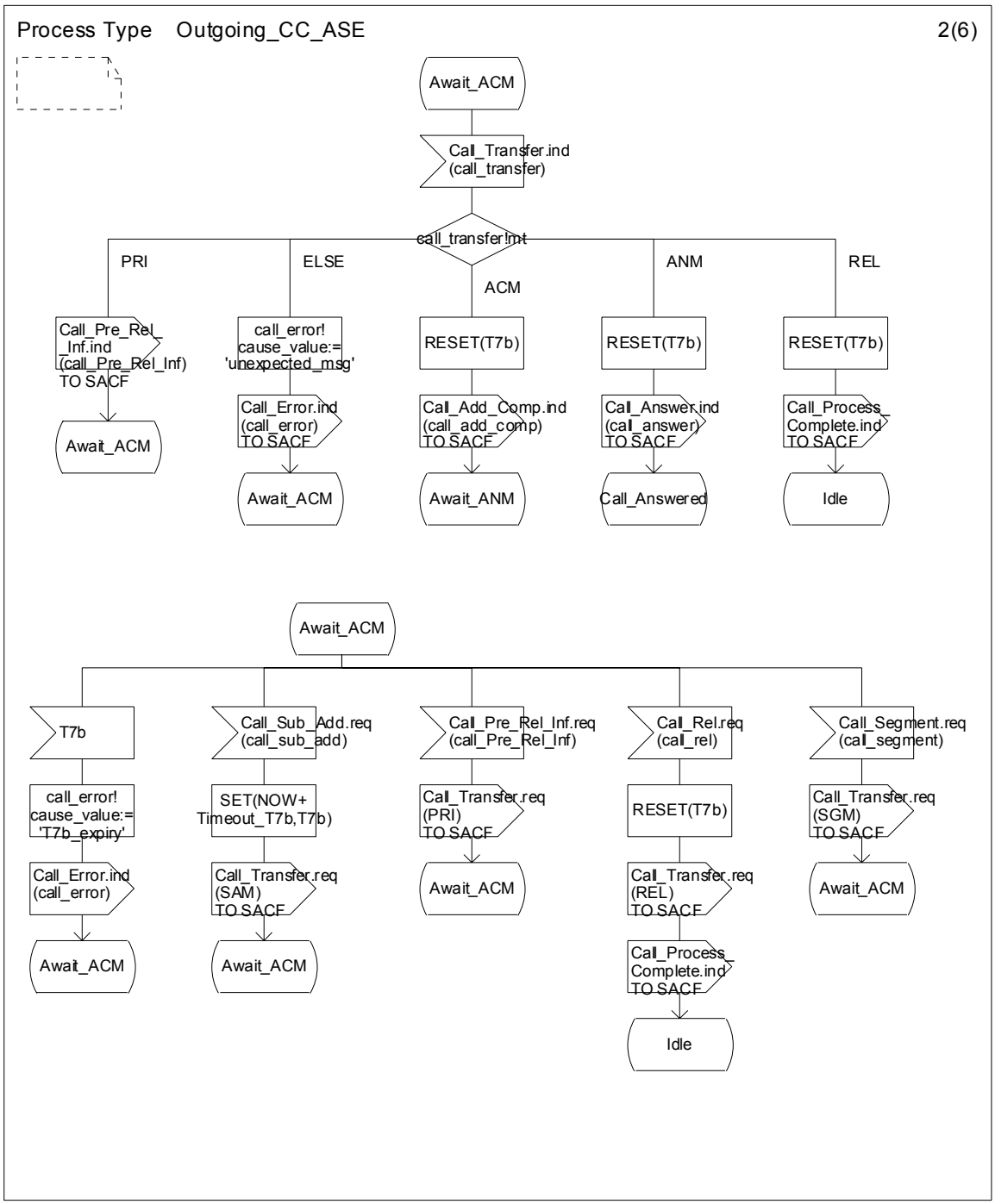

Figure 8-2/Q.2764 ***(sheet 2 of 6)***

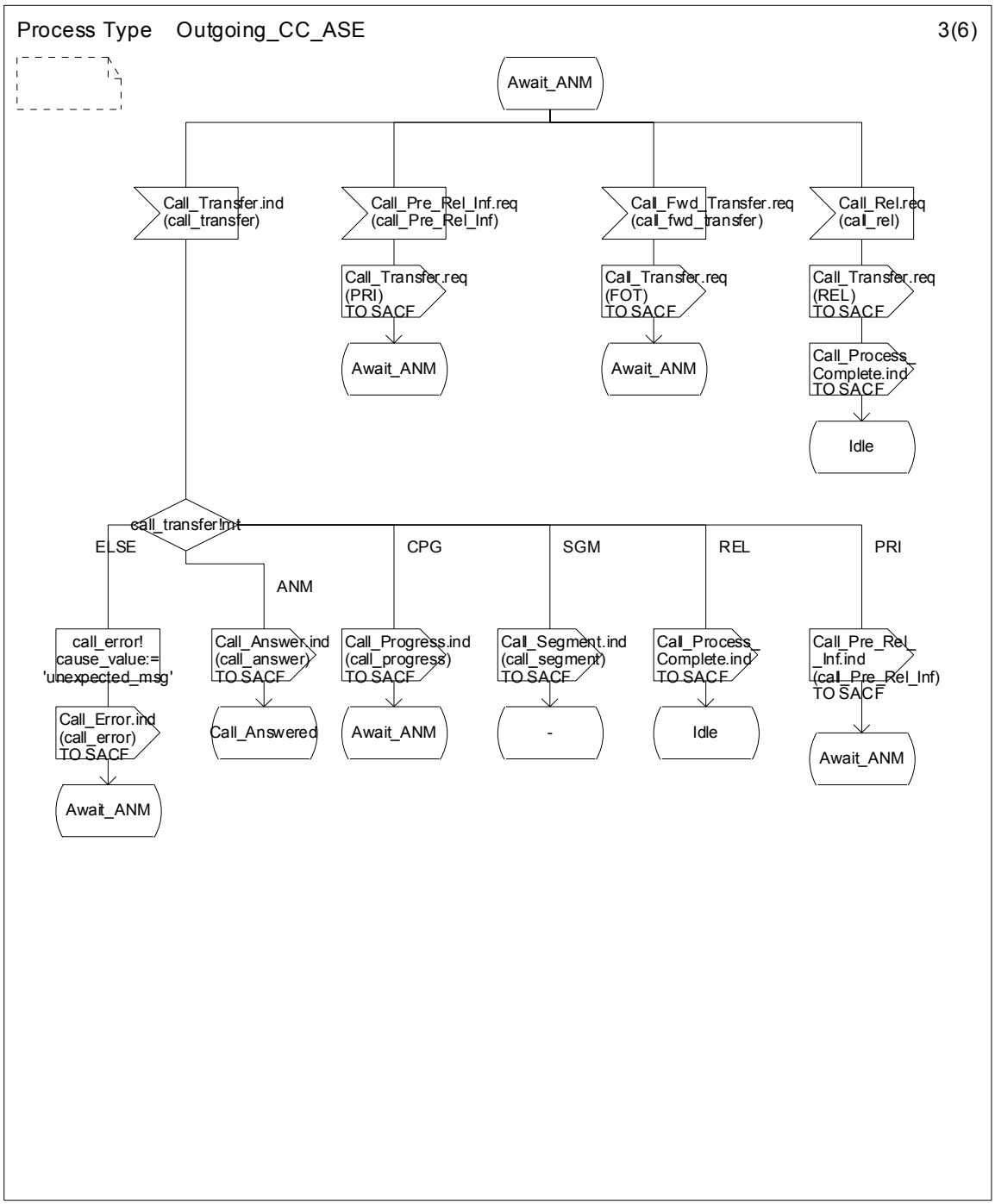

Figure 8-2/Q.2764 ***(sheet 3 of 6)***

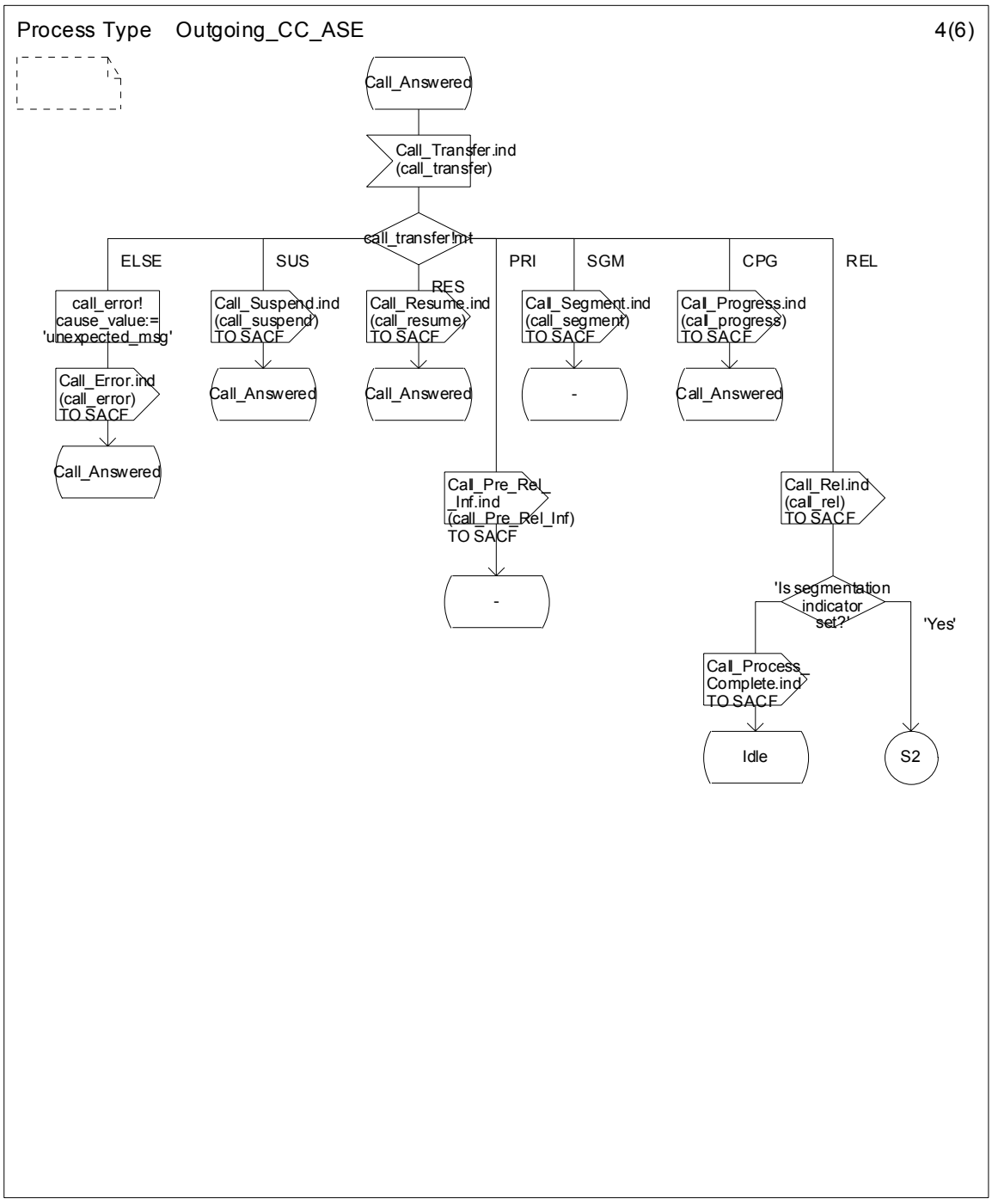

Figure 8-2/Q.2764 ***(sheet 4 of 6)***

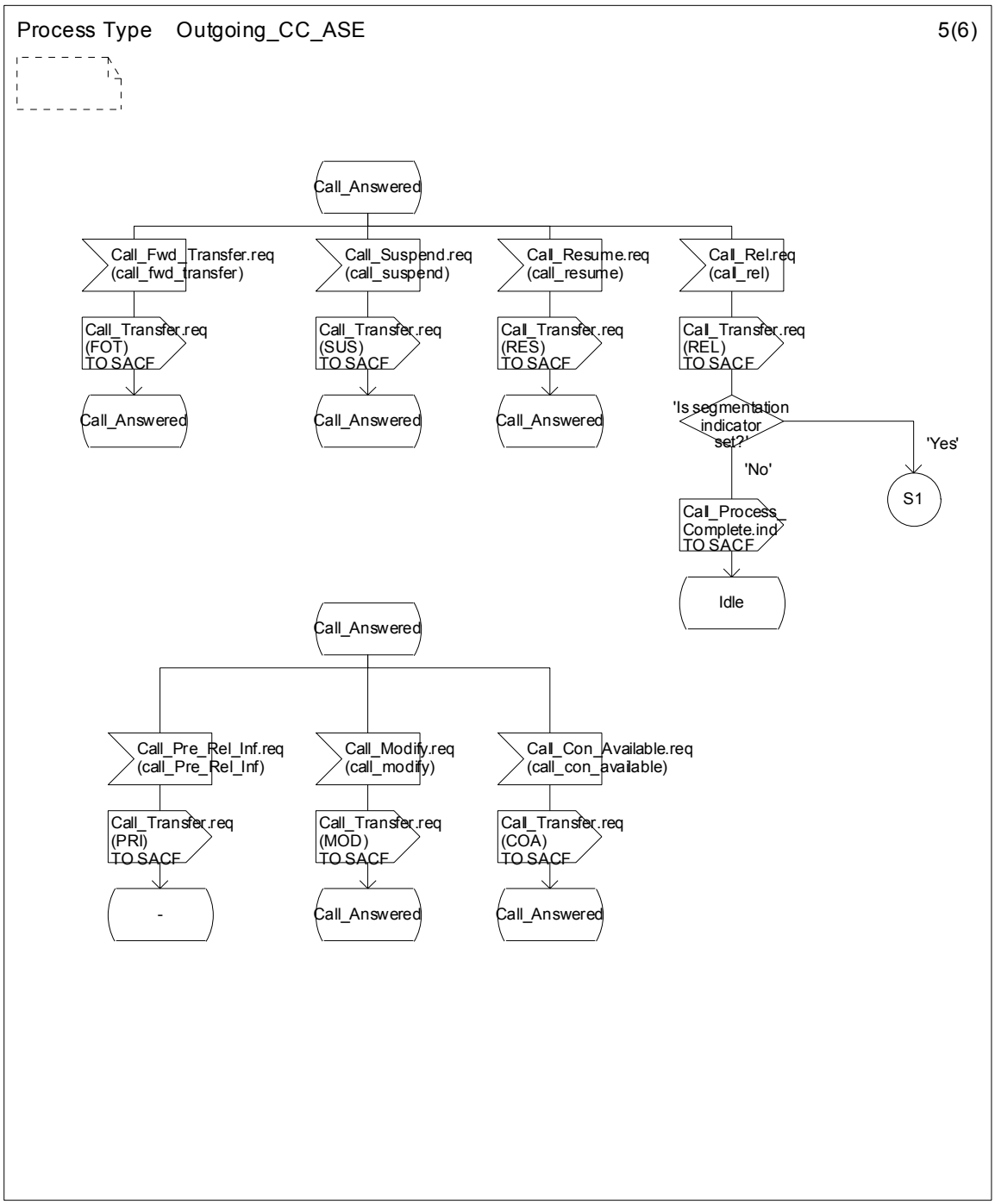

Figure 8-2/Q.2764 ***(sheet 5 of 6)***

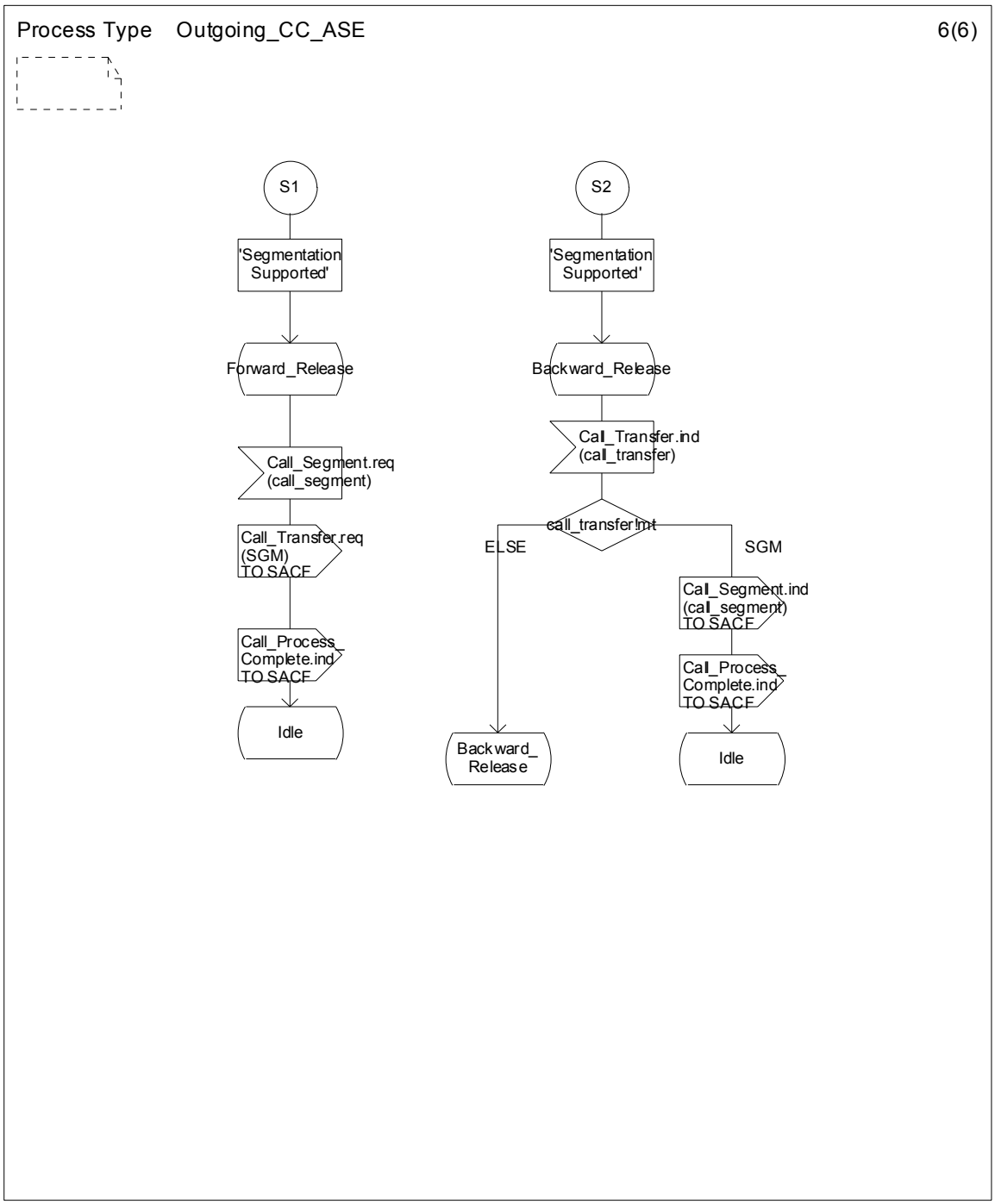

Figure 8-2/Q.2764 ***(sheet 6 of 6)***

9 Maintenance control ASE (MC ASE)

9.1 Primitive interface

MC ASE provides a set of services to its user, these are listed in Table 9-1. This subclause describes the procedures internal to the MC ASE that provide the services to its user.

Table 9-1/Q.2764 – Primitives between SACF and MC ASE

Primitive name	Types
Block	Request/Indication/Response/Confirmation
Unblock	Request/Indication/Response/Confirmation
Reset	Request/Indication/Response/Confirmation
User_Part_Test	Request/Indication/Response/Confirmation
Error	Indication
Congestion_Level	Request/Indication
Check_Begin	Request/Indication/Response/Confirmation
Check_End	Request/Indication/Response/Confirmation

Tables 9-2 to 9-9 (see 9.7) list the parameters for the service primitives on this interface.

MC ASE uses the SACF service primitives: Transfer request/indication.

9.2 Resource reset

9.2.1 Sending reset

When a Reset request primitive is received, the contents are sent to SACF in a Transfer request primitive. Timer "Await Reset Acknowledgement" is started.

When the Reset Acknowledgement message is received in a Transfer indication primitive, it is passed to SACF as a Reset confirmation primitive. Timer "Await Reset Acknowledgement" is stopped.

9.2.2 Receiving reset

When a Reset message is received in a Transfer indication primitive, it is sent to the SACF as a Reset indication primitive.

When the Reset response primitive is received, the contents are sent to SACF in a Transfer request primitive.

9.2.3 Exceptional procedures

When timer "Await Reset Acknowledgement" expires, management is informed. An Error indication primitive is issued.

For unexpected message handling, see the SDL diagrams in 9.8.

9.3 Resource blocking

9.3.1 Sending blocking/unblocking

When a Block request primitive is received, the contents are sent to SACF in a Transfer request primitive. Timer "Await Blocking Acknowledgement" is started.

When a Blocking Acknowledgement message is received in a Transfer indication primitive, it is sent to SACF in a Block confirmation primitive. Timer "Await Blocking Acknowledgement" is stopped.

When an Unblock request primitive is received, the contents are sent to SACF in a Transfer request primitive. Timer "Await Unblocking Acknowledgement" is started.

When an Unblocking Acknowledgement message is received in a Transfer indication primitive, it is sent to SACF in a Block confirmation primitive. Timer "Await Unblocking Acknowledgement" is stopped.

9.3.2 Receiving blocking/unblocking

When a Blocking message is received in a Transfer indication primitive, it is sent to the SACF as a Block indication primitive.

When the Block response primitive is received, the contents are sent to SACF in a Transfer request primitive.

When an Unblocking message is received in a Transfer indication primitive, it is sent to the SACF as an Unblock indication primitive.

When the Unblock response primitive is received, the contents are sent to SACF in a Transfer request primitive.

9.3.3 Exceptional procedures

When timer "Await Blocking Acknowledgement" expires, management is informed. An Error indication primitive is issued.

When timer "Await Unblocking Acknowledgement" expires, management is informed. An Error indication primitive is issued.

For unexpected message handling, see the SDL diagrams in 9.8.

9.4 User part availability

9.4.1 Procedures

When a User_Part_Available request primitive is received, the contents are sent to SACF in a Transfer request primitive, and timer "User Part Availability" is started. If timer "User Part Availability" expires, the User_Part_Available request primitive contents shall be re-sent to SACF in a Transfer request primitive.

When a User Part Available message is received in a Transfer indication primitive, it is sent to the SACF as a User_Part_Available confirmation primitive, and timer "User Part Availability" is stopped.

When a User Part Test message is received in a Transfer indication primitive, it is sent to the SACF as User_Part_Available indication primitive.

When a User_Part_Available response primitive is received, the contents are sent to SACF in a Transfer request primitive.

9.4.2 Exceptional procedures

For unexpected message handling, see the SDL diagrams in 9.8.

9.5 Congestion level parameter

The Automatic Congestion Level parameter is passed through MC ASE. When it is received in a Transfer indication primitive, a Congestion_Level indication is issued. When a Congestion_Level request is received, the Automatic Congestion Level parameter is passed on in a Transfer request.

9.6 Resource testing

9.6.1 Sending VPCI Consistency Request/VPCI Consistency Check End

When a Check_Begin request primitive is received, the contents are sent to SACF in a Transfer request primitive. Timer "Await Consistency Check Request Acknowledgement" is started.

When the Consistency Check Request Acknowledgement message is received in a Transfer indication primitive, it is passed to the SACF as a Check_Begin confirmation primitive. Timer "Await Consistency Check Request Acknowledgement" is stopped.

When a Check_End request primitive is received, the contents are sent to SACF in a Transfer request primitive. Timer "Await Consistency Check End Acknowledgement" is started.

When the Consistency Check End Acknowledgement message is received in a Transfer indication primitive, it is passed to the SACF as a Check_End confirmation primitive. Timer "Await Consistency Check End Acknowledgement" is stopped.

9.6.2 Receiving VPCI Consistency Request/VPCI Consistency Check End

When a Consistency Check Request message is received in a Transfer indication primitive, it is sent to the SACF as a Check_Begin indication primitive.

When the Check_Begin response primitive is received, the contents are sent to SACF in a Transfer request primitive.

When a Consistency Check End message is received in a Transfer indication primitive, it is sent to the SACF as a Check_End indication primitive.

When the Check_End response primitive is received, the contents are sent to SACF in a Transfer request primitive.

9.6.3 Exceptional procedures

When timer "Await Consistency Check Request Acknowledgement" expires, management is informed. An Error indication primitive is issued.

When timer "Await Consistency Check End Acknowledgement" expires, management is informed. An Error indication primitive is issued.

For unexpected message handling, see the SDL diagrams in 9.8.

9.7 Primitive contents

Tables 9-2 to 9-9 list the contents for the MC ASE service primitives.

Table 9-2/Q.2764 – Parameters for Block/Unblock/Reset Request/Indication primitive

Message Compatibility Information
Resource Identifier

Table 9-3/Q.2764 – Parameters for Block/Unblock/Reset Response/Confirmation primitive

Message Compatibility Information

Table 9-4/Q.2764 – Parameters for User_Part_Test Request/Indication/Response/Confirmation primitive

Message Compatibility Information

Table 9-5/Q.2764 – Parameters for Congestion_Level Request/Indication primitive

Automatic Congestion Level

Table 9-6/Q.2764 – Parameters for Check_Resource_Begin Request/Indication primitive

Message Compatibility Information
Resource Identifier

Table 9-7/Q.2764 – Parameters for Check_Resource_Begin Response/Confirmation primitives

Message Compatibility Information

Table 9-8/Q.2764 – Parameters for Check_Resource_End Request/Indication primitive

Message Compatibility Information

Table 9-9/Q.2764 – Parameters for Check_Resource_End Response/Confirmation primitive

Message Compatibility Information
Consistency check result information

9.8 SDL diagrams

If any difference is found between the procedures described in these SDLs and the procedures described in the text, the text shall take precedence. (See Figure 9-1.)

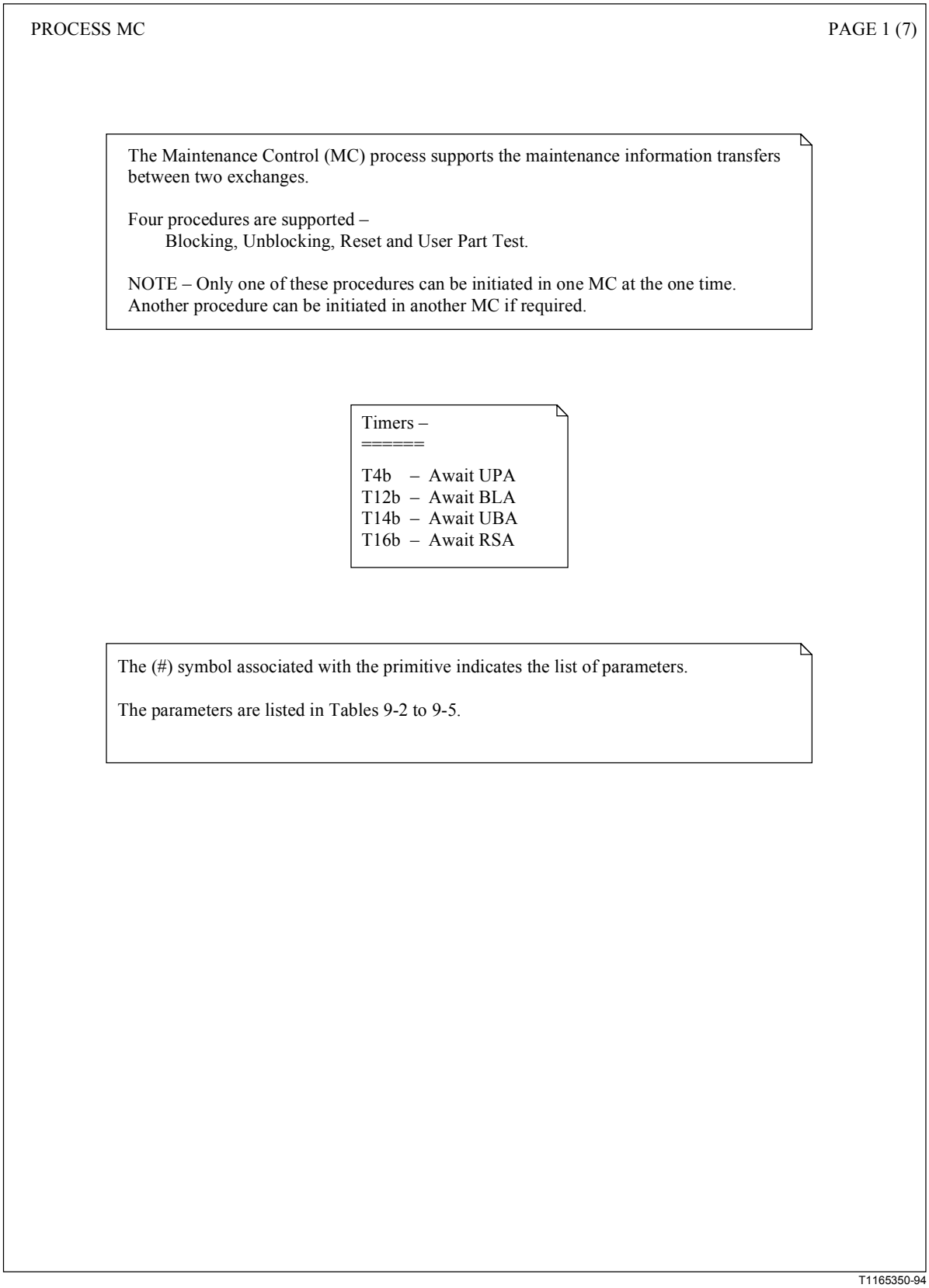

Figure 9-1/Q.2764 ***(sheet 1 of 7)***

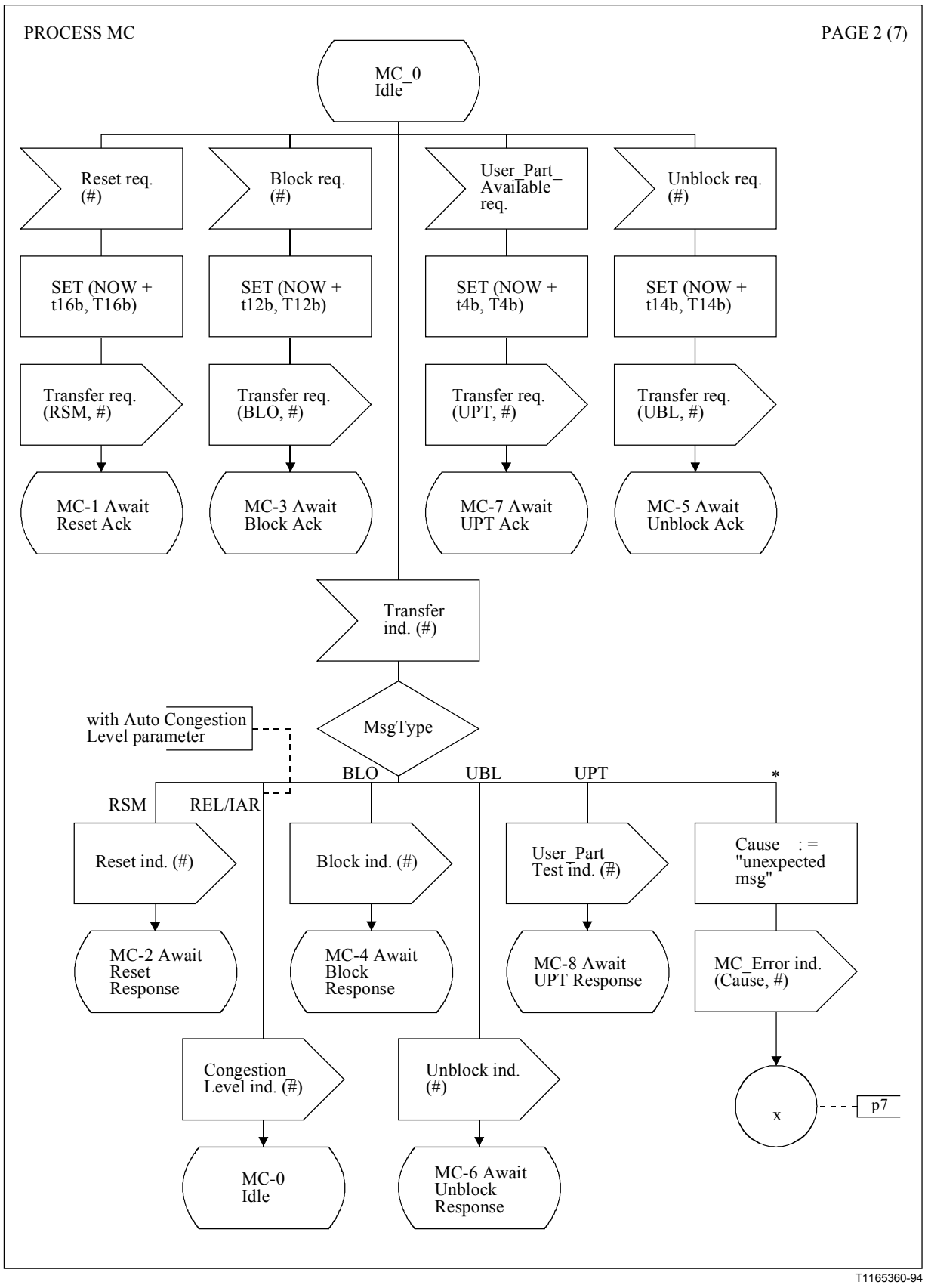

Figure 9-1/Q.2764 ***(sheet 2 of 7)***

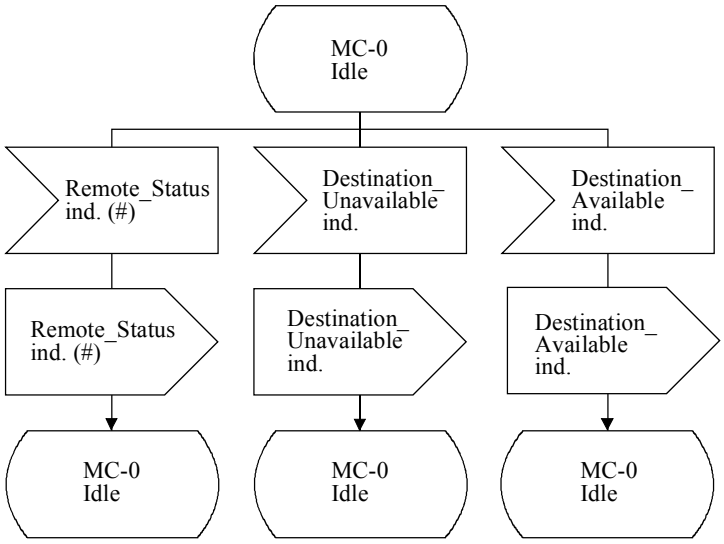

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Figure 9-1/Q.2764 ***(sheet 3 of 7)***

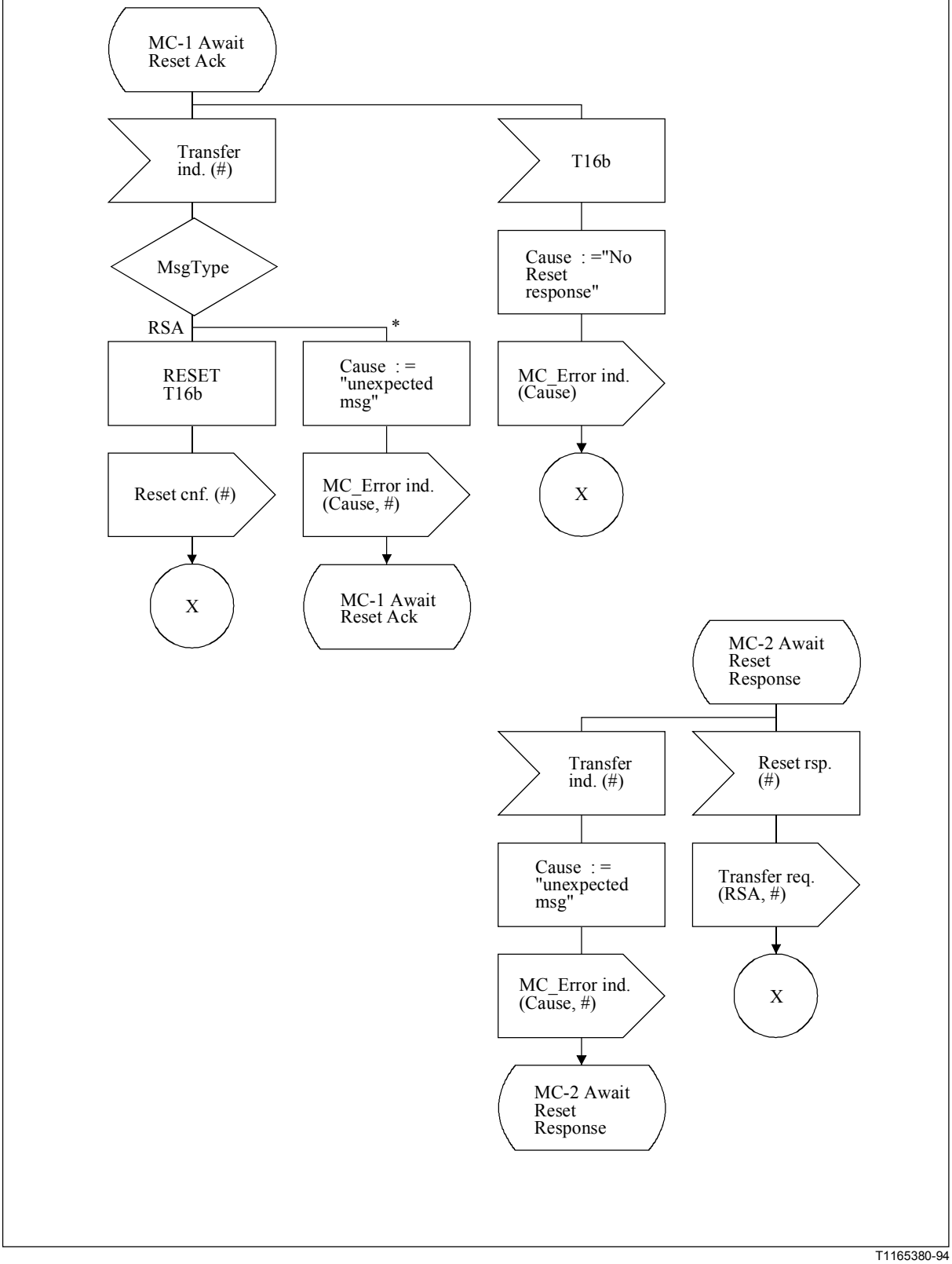


Figure 9-1/Q.2764 ***(sheet 4 of 7)***

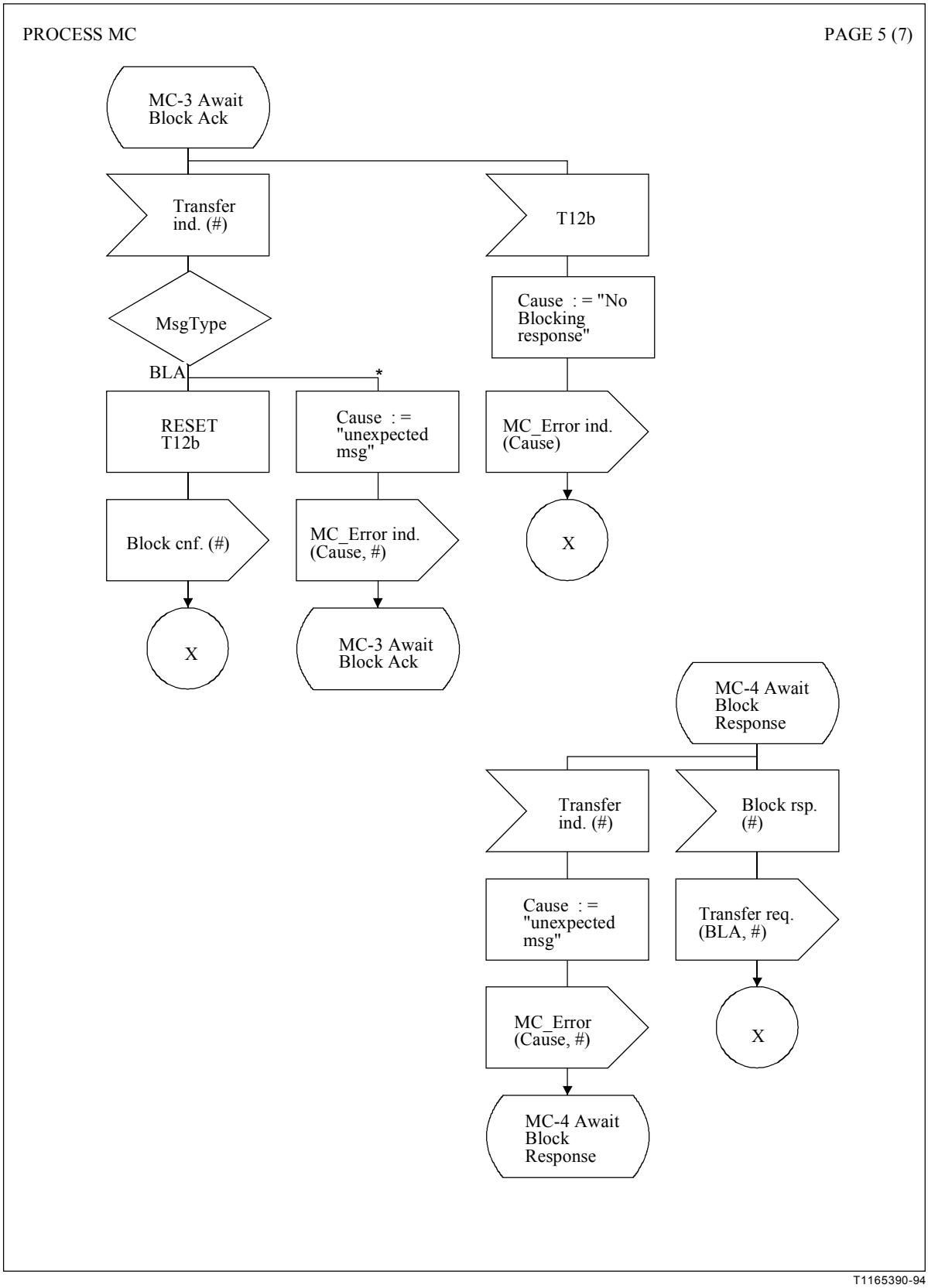


Figure 9-1/Q.2764 ***(sheet 5 of 7)***

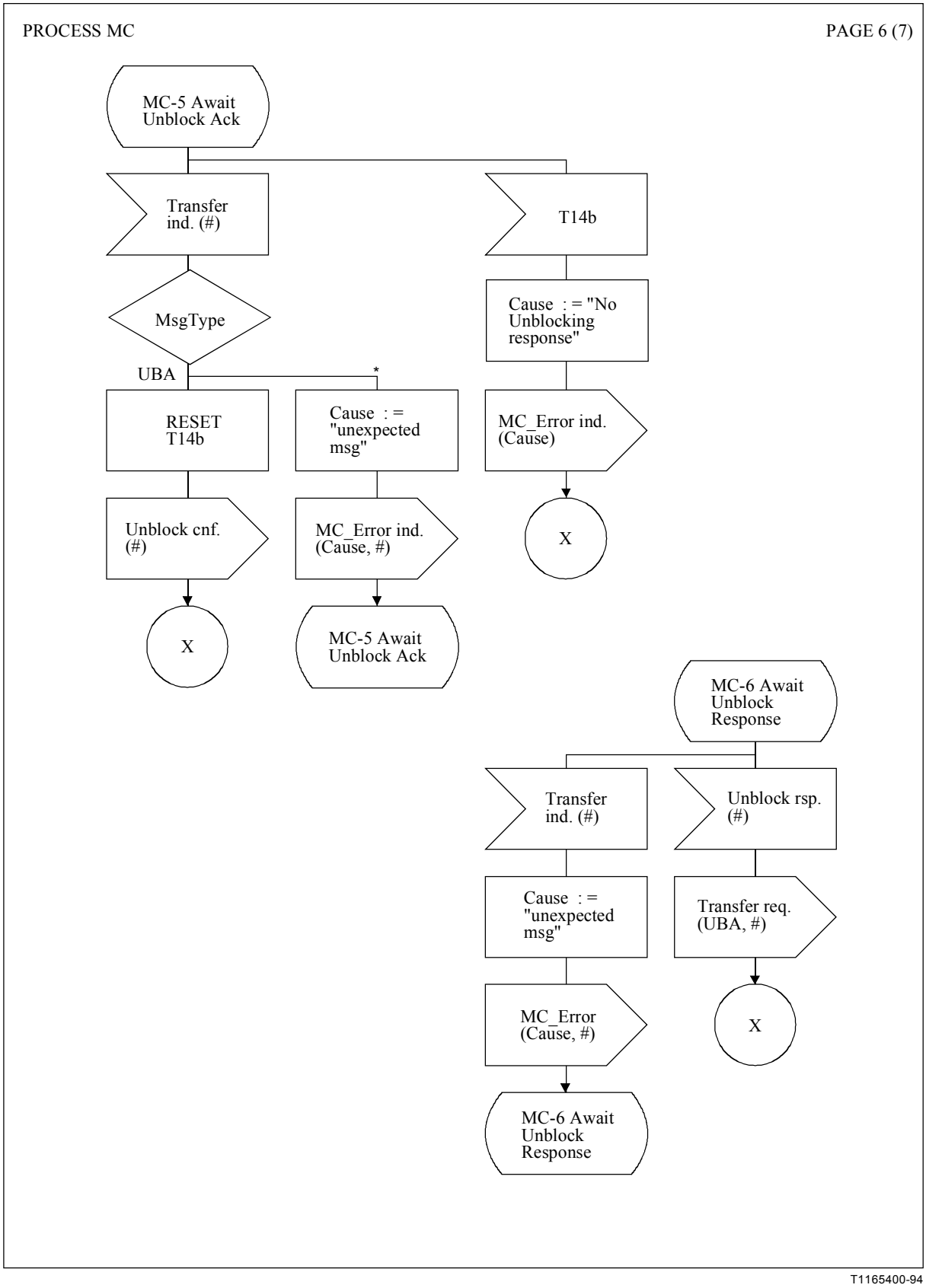


Figure 9-1/Q.2764 ***(sheet 6 of 7)***

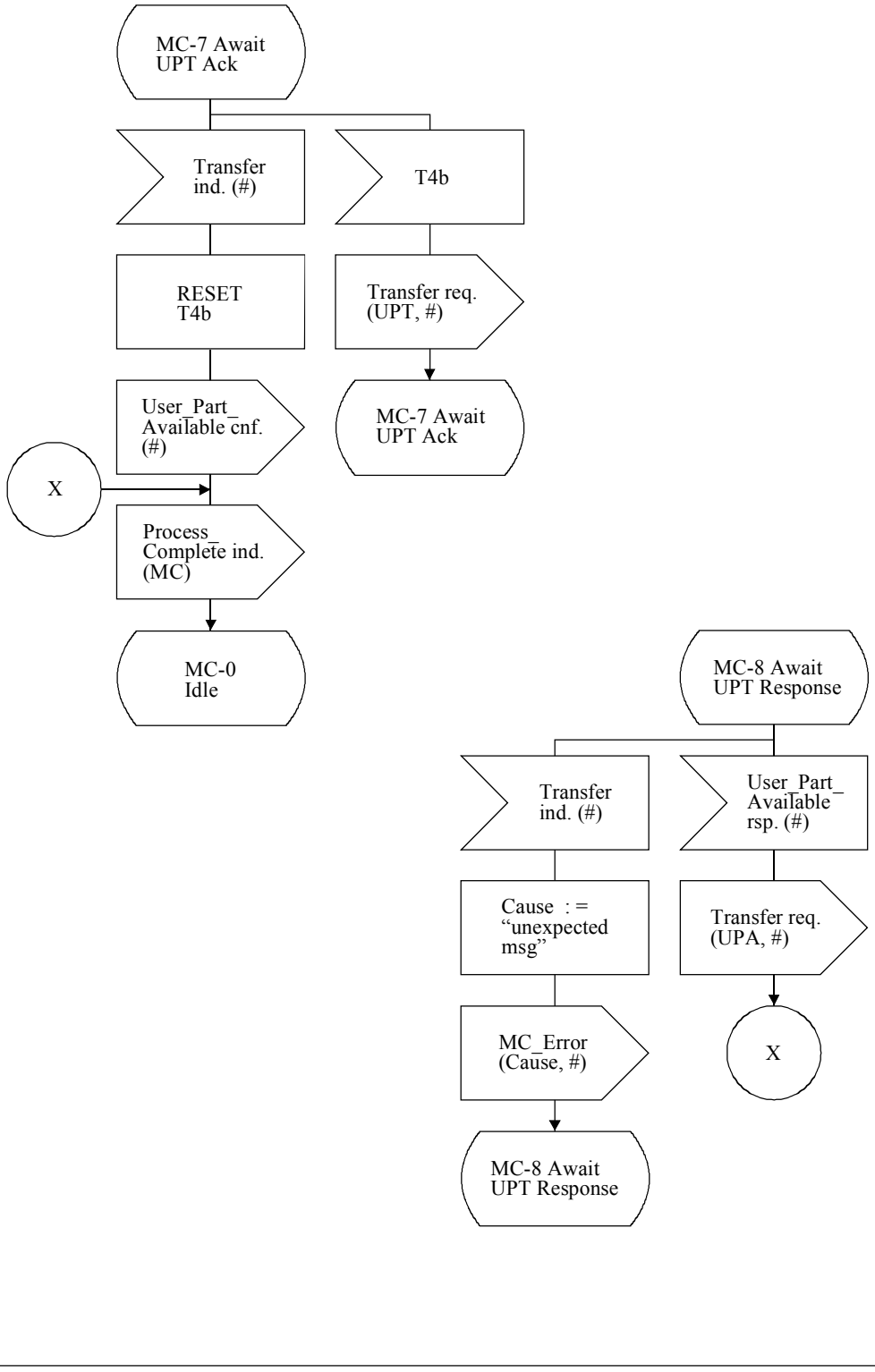


Figure 9-1/Q.2764 ***(sheet 7 of 7)***

10 Unrecognized Information ASE (UI ASE)

This clause specifies the protocol procedures relating to the handling of unrecognized information.

10.1 Primitive interface

UI ASE provides a set of services to its user, these are listed in Table 10-1.

Table 10-1/Q.2764 – Primitives between SACF and UI ASE

Primitive name	Types
Unrecognized_Message	Request/Indication
Unrecognized_Parameter	Request/Indication
Confusion	Request/Indication

The Unrecognized_Message primitive can contain any B-ISUP message.

The Unrecognized_Parameter primitive can contain any number of B-ISUP parameters.

UI ASE uses the SACF service primitives: Transfer request/indication.

10.2 Unrecognized parameters

10.2.1 Received parameters

SACF passes unrecognized parameters to UI ASE in a Transfer indication primitive.

UI ASE passes all unrecognized parameters back to SACF in an Unrecognized_Parameter indication primitive.

10.2.2 Sent parameters

SACF passes unrecognized parameters received from the Application Process to UI ASE in an Unrecognized_Parameter request primitive.

UI ASE passes all unrecognized parameters back to SACF in a Transfer request primitive.

10.3 Unrecognized messages

10.3.1 Received messages

SACF passes unrecognized messages to UI ASE in a Transfer indication primitive.

UI ASE passes all unrecognized messages back to SACF in an Unrecognized_Message indication primitive.

10.3.2 Sent messages

SACF passes unrecognized messages received from the Application Process to UI ASE in an Unrecognized_Message request primitive.

UI ASE passes all unrecognized messages back to SACF in an Transfer request primitive.

10.4 Confusion messages

When UI ASE received a Transfer indication containing a Confusion message, it is passed on as a Confusion indication primitive.

When a Confusion request primitive is received, it is sent as a Confusion message in a Transfer request primitive.

10.5 Primitive contents

See Table 10-2.

Table 10-2/Q.2764 – Parameters for Confusion Request/Indication primitive

Confusion Request/Indication	
Parameter	**Mandatory/Optional**
Message Compatibility Information	M
Cause	M

10.6 SDL diagrams

If any difference is found between the procedures described in these SDLs and the procedures described in the text, the text shall take precedence. (See Figure 10-1.)

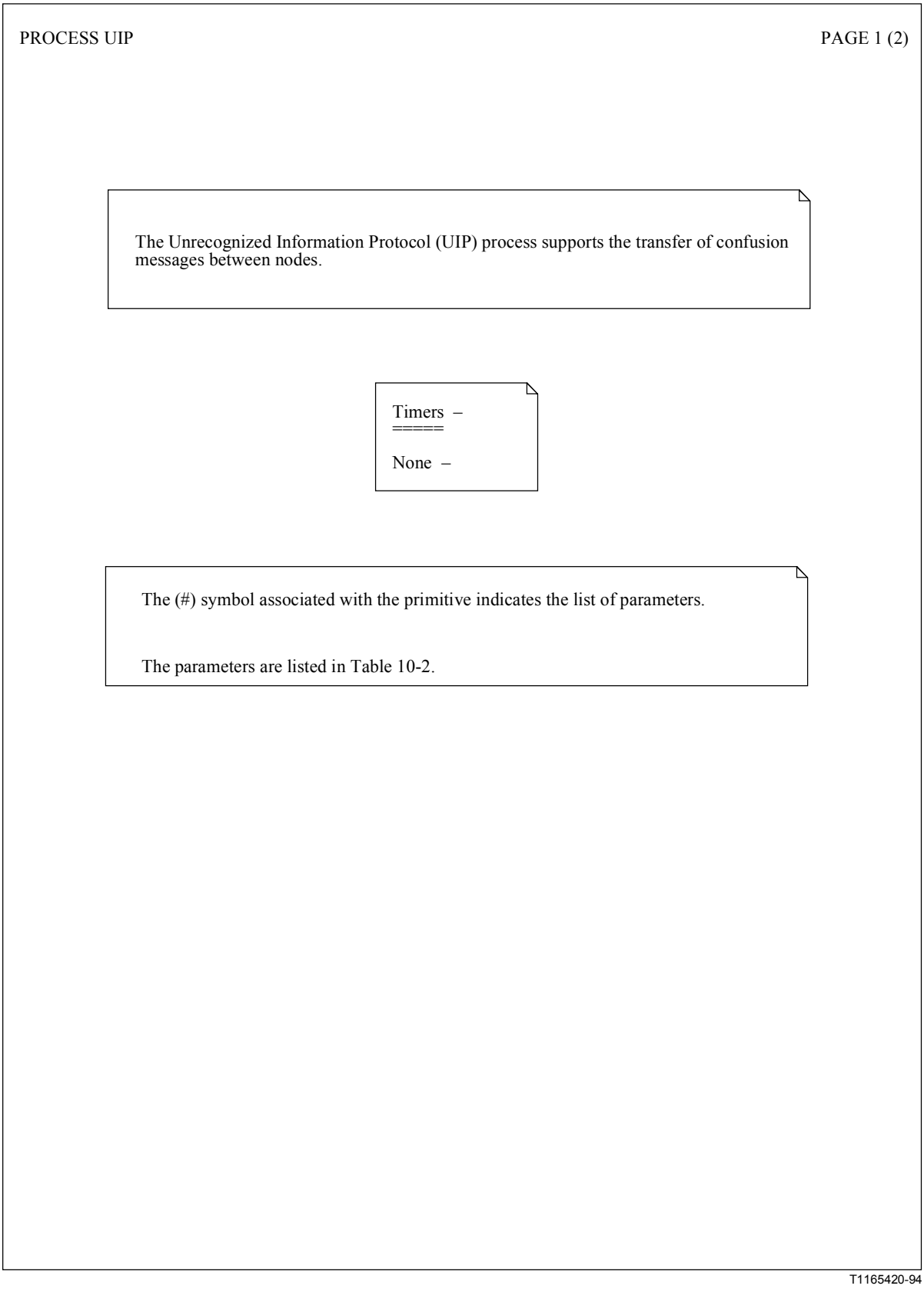


Figure 10-1/Q.2764 ***(sheet 1 of 2)***

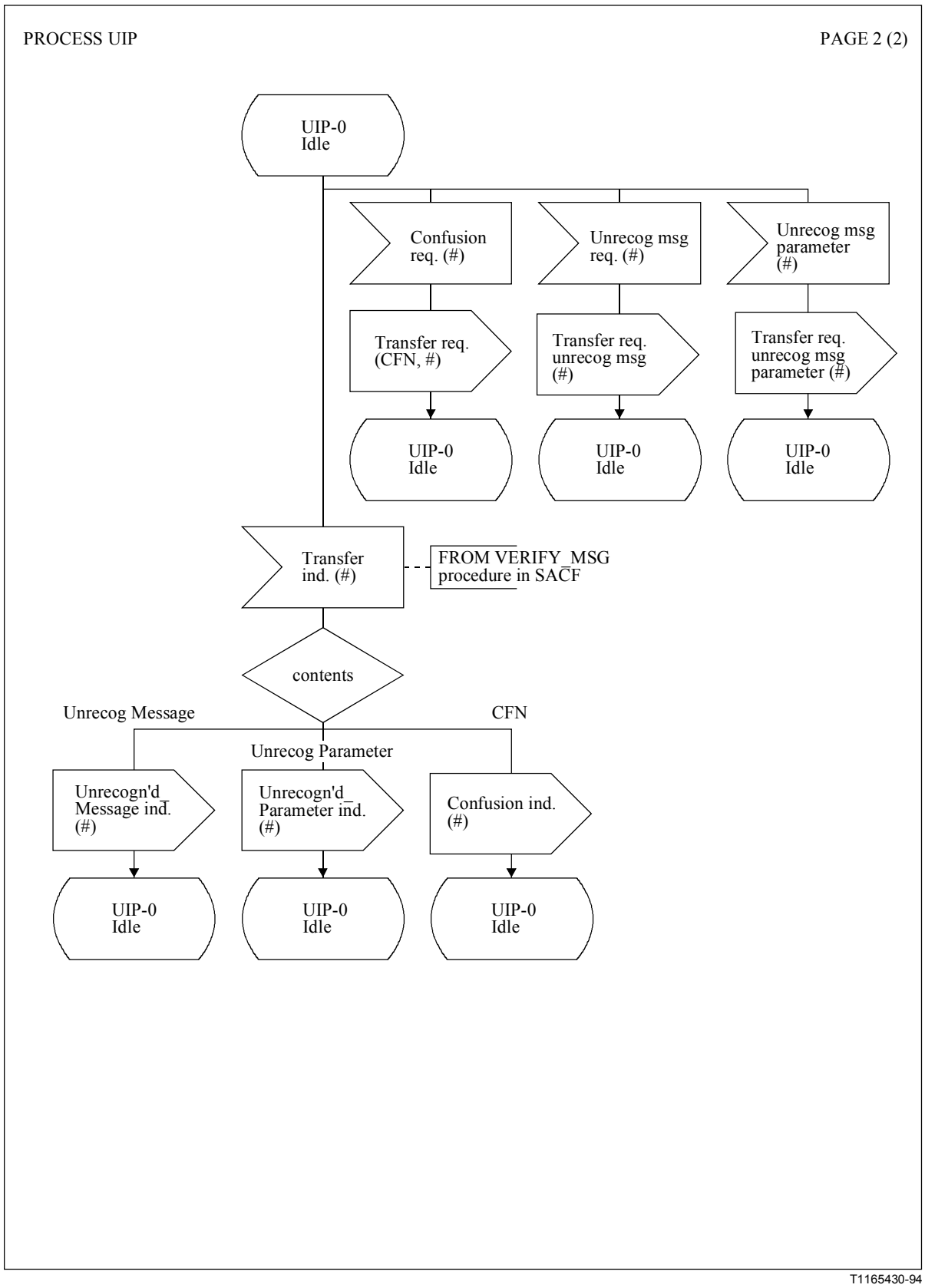


Figure 10-1/Q.2764 ***(sheet 2 of 2)***

11 Timers in B-ISUP

This clause specifies all the Application Process and protocol timers relevant for B-ISUP. For each timer the timeout value, cause for initiation of that timer, normal termination event(s) for the timer, and actions to be performed on expiry of the timer, are given. Furthermore, in the last column reference to the relevant Application Process description, or ASE description is given, where a full description of the procedure is to be found. (See Tables 11-1 and 11-2.)

Table 11-1/Q.2764 – Timers in B-ISUP

Symbol (name)	Time-out value	Cause for initiation	Normal termination	At expiry	Reference
Await Release Complete (T1b)	15-60 seconds	When Release message is sent	At receipt of Release Complete message	Release resources, alert maintenance system, send Reset message	2.10, 3.2, 7.1, 7.2
User Part Availability (T4b)	5-15 minutes	At receipt of MTP-STATUS primitive with the cause "remote user unavailable"	On expiry, or at receipt of User Part Available message NOTE – On the receipt of any other message the AEI is deleted by the application process	Send User Part Test message. Start T4b	9.4
Await Network Resume (T6b)	As specified in ITU-T Q.118	When controlling exchange receives Suspend (network)	At the receipt of Resume (network) message or Release message	Initiate release procedure	2.5
Await Address Complete (T7b)	20-30 seconds	When the latest address message is sent	When the condition for normal release of address and routing information is met (receipt of Address Complete, Answer messages)	Release all equipment and connection (send Release message)	2.10, 8
Await answer (T9b)	As specified in ITU-T Q.118	When national controlling or outgoing international exchange receives Address Complete message	At the receipt of Answer message	Release connection, send Release message	2.2.4, 2.2.6
Await Blocking Acknowledge (T12b)	15-60 seconds	When Blocking message is sent	At receipt of Blocking Acknowledgement	Alert Maintenance system	9.3
Await Unblocking Acknowledge (T14b)	15-60 seconds	When Unblocking message is sent	At receipt of Unblocking Acknowledgement	Alert Maintenance system	9.3
Await Reset Acknowledge (T16b)	15-60 seconds	When Reset message is sent	At receipt of Reset Acknowledgement message	Resend Reset message	9.2, 3.2.3
Repeat Reset (T17b)	5-15 minutes	When the Reset message is sent	At receipt of Reset Acknowledgement message	Resend Reset message, Alert maintenance Start T17b	3.2

Table 11-2/Q.2764 – Timers in B-ISUP

Symbol (name)	Time-out value	Cause for initiation	Normal termination	At expiry	Reference
Short SCC (T29b)	300-600 ms	Congestion indication received when T29b not running	–	New congestion indication will be taken into account	3.7
Long SCC (T30b)	5-10 seconds	Congestion indication received when T29b not running		Restore traffic by one step if not yet at full load and start T30b	3.7
Segmentation (T34b)	2-4 seconds	When indication of a segmented message is received	At receipt of a segmentation message	Proceed with call	2.2.10
Address incomplete (T35b)	15-20 seconds	At receipt of the last address digit (<>ST) and before the minimum or fixed number of digits have been received	At receipt of ST or when the minimum or fixed number of digits have been received	Send Release message	2.3.5
Await Network Resume-International (T38b)	As specified in ITU-T Q.118	When the incoming international exchange sends to the preceding exchange a Suspend (network) message	At receipt of Resume (network) message or Release message	Send Release message	2.5
Await IAM Acknowledge (T40b)	4-6 seconds	When Initial Address Message is sent	At receipt of IAM Acknowledgement or IAM Reject	Release resources, alert maintenance system, send Reset message	2.10, 3.2, 7.2
Await Consistency Check Request Acknowled-gement (T41b)	15-60 seconds	When Consistency Check Request message is sent	At receipt of Consistency Check Request Acknowledgement	Alert Maintenance system	9.6
Await Consistency Check End Acknowled-gement (T42b)	15-60 seconds	When Consistency Check End message is sent	At receipt of Consistency Check End Acknowledgement	Alert Maintenance system	9.6
Await Modify Acknowledge (T43b)	20-30 seconds	When Modify message is sent	At receipt of Modify Acknowledge message or Modify Reject message	Initiate release connection procedure	2.10, 7.2.3

12 Interactions of capabilities

12.1 Cell Delay Variation Tolerance Indication

12.1.1 Cell Delay Variation Tolerance Indication interaction with traffic parameter negotiation at connection establishment

When one or more than one traffic parameters of a connection is negotiated at connection establishment, using the procedures defined in ITU-T Recommendation Q.2725.1, for a connection to which CDVT values other than the default values are expected or required, the CDVT values indicated shall be unique to the common set or range of traffic parameter negotiated values.

This ITU-T Recommendation does not define procedures for indicating non-default CDVT values dependent on negotiable traffic parameters.

For further guidelines with respect to user aspects, see ITU-T Q.2961.5.

12.1.2 Cell Delay Variation Tolerance Indication interaction with connection modification

When one or more than one traffic parameters of a connection is modified, using the procedures defined in ITU-T Recommendation Q.2725.2 or Q.2725.4, for a connection to which CDVT values other than the default values have been indicated or confirmed, the CDVT values allocated at connecting establishment shall be maintained unchanged.

This ITU-T Recommendation does not define procedures for indicating non-default CDVT values dependent on negotiable traffic parameters.

For further guidelines with respect to user aspects, see ITU-T Q.2961.5.

ANNEX A

B-ISUP specification model

A.1 Introduction

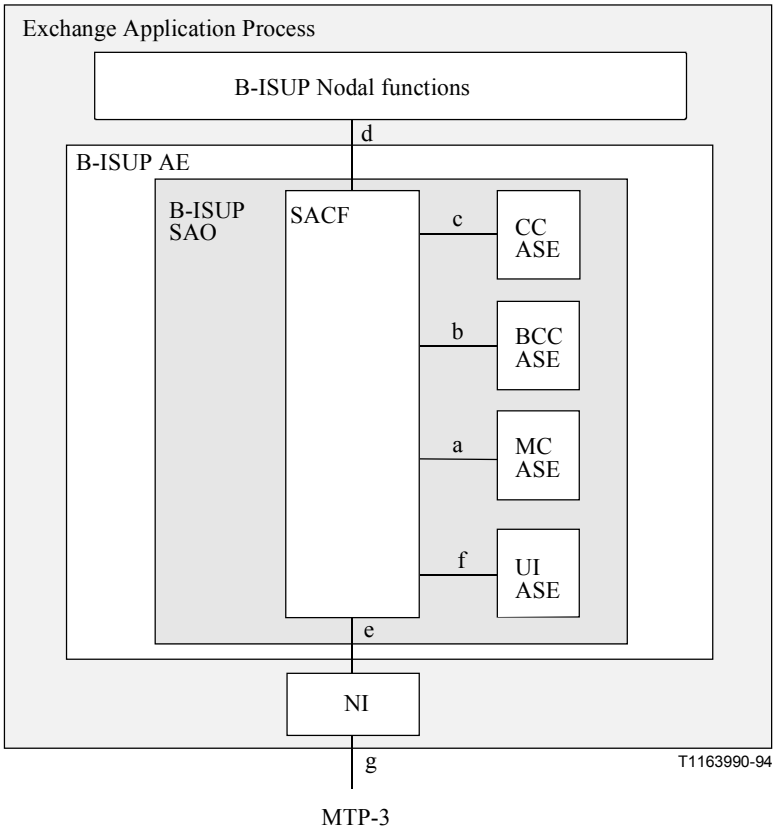
The model used to structure the description of B-ISUP procedures is based on the OSI Application Layer Structure (ALS) model, see ITU-T Recommendation Q.1400. This annex presents the model and gives a general description of its operation.

A.2 General model

The generalized model for the B-ISUP Basic Call Application Process is shown in Figure A.1.

This figure does not represent the situation at any specific point during B-ISUP procedures, but instead it shows the full picture of the architecture. Specific application of this model is discussed in the following subclause of this annex.

This figure shows the primitive interfaces between the functional blocks, as used in the body of this ITU-T Recommendation.



AE Application Entity
ASE Application Service Element
BCC Bearer Connection Control
CC Call Control
MC Maintenance Control
NI Network Interface
SACF Single Association Control Function
SAO Single Association Object
UI Unrecognized Information

Figure A.1/Q.2764 – BISUP specification model

Interfaces a, b, c, d, e, f and g are Primitive interfaces. Interface g is the MTP Level 3 Service interface as described in clause 6/Q.2761.

All functions also have an interface to a "Management application", this is not defined as a formal primitive interface.

The term "Exchange Application Process" is used to describe all the Application functionality in an exchange. B-ISUP is a part of the Exchange Application Process. Thus the B-ISUP Nodal functions shown on the model are referred to as the B-ISUP Application Process functions in the body of this Recommendation.

The B-ISUP AE provides all the communication capabilities required by the B-ISUP Nodal functions. For simplicity, a B-ISUP AE is defined as containing just one SAO; this avoids the need to specify a Multiple Association Control Function (MACF). Thus, all coordination between B-ISUP signalling associations is performed via the B-ISUP Nodal functions.

The BCC and CC ASEs both consist of two distinct sets of functions; one set used on the incoming side of an exchange (supporting the signalling association with a preceding exchange), and one set used on the outgoing side of an exchange (supporting the signalling association to a subsequent exchange).

The SAO contained in the B-ISUP AE is one of the following types:

a) *Incoming call and connection control*

This contains:

- Incoming BCC, Incoming CC, MC (Note 2) and UI ASEs, and SACF.

b) *Outgoing call and connection control*

This contains:

- Outgoing BCC, Outgoing CC, MC (Note 2) and UI ASEs, and SACF.

c) *Maintenance*

This contains:

- MC and UI ASEs, and SACF.

NOTE 1 – Only one SACF description is provided. Different subsets of this description are used for each of the SAO types mentioned above.

NOTE 2 – The MC ASE is included in these SAO types only to handle the Automatic Congestion Control parameter. This is received in Call/Connection control messages, but is considered "Maintenance" type information.

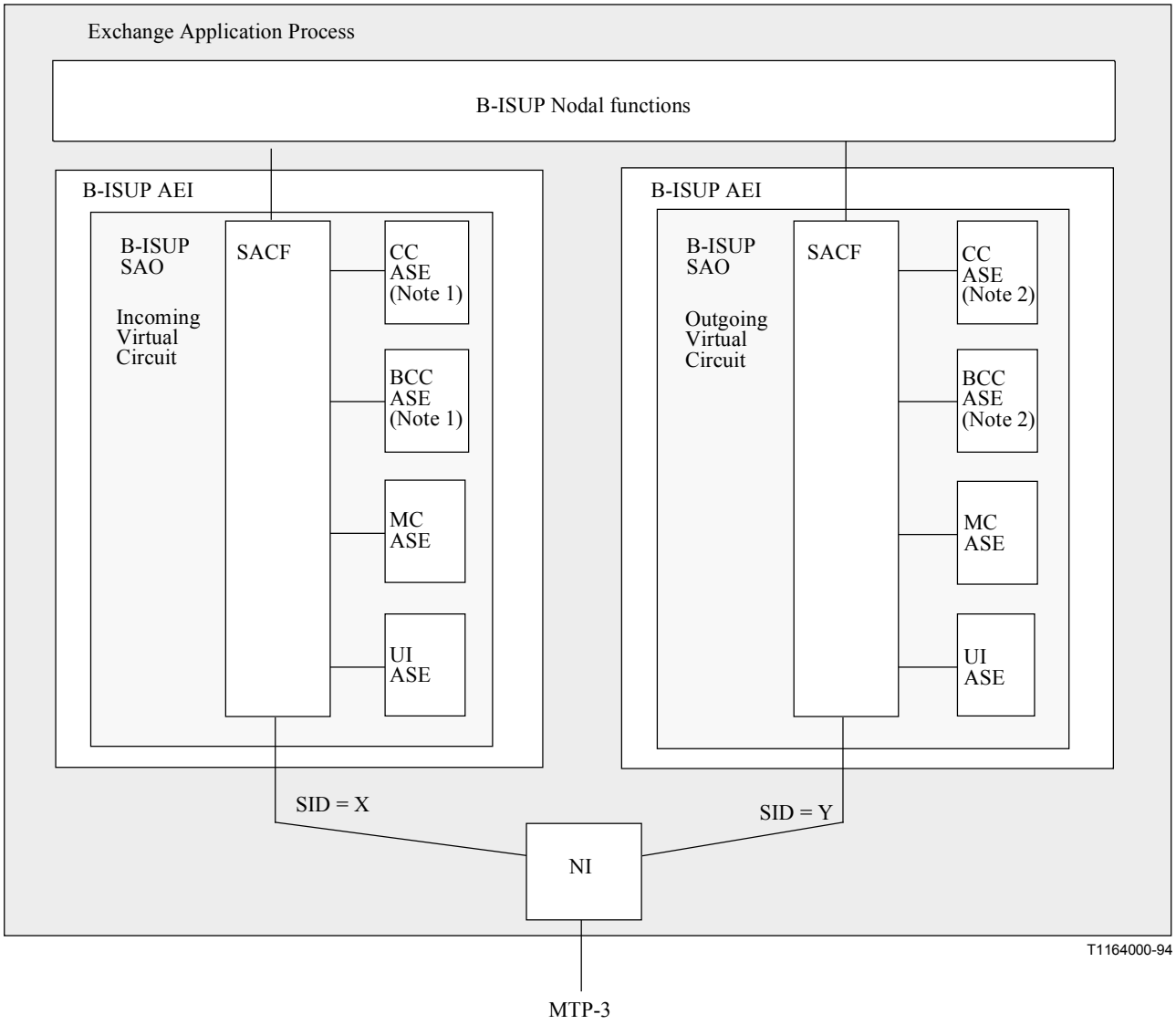
To handle any particular B-ISUP function, the Exchange Application Process creates an instance of the required B-ISUP Nodal functions. B-ISUP will create instances, as required, of the B-ISUP AE. This is further discussed in the following subclause.

The Network Interface (NI) function exists to distribute messages received from the MTP to the appropriate instance of the B-ISUP AE. There is only one instance of the NI in an exchange.

A.3 Application of the specification model

An instance of the B-ISUP AE (an AEI) is created for each signalling association required. Thus, an intermediate exchange is modelled as shown in Figure A.2.

Each instance of the B-ISUP AE within one exchange is identified by a unique Signalling Identifier value (SID). This value is allocated when the AEI is created, and deallocated when the service provided by the AEI is no longer required and the AE instance is deleted. This SID value is used to label signalling messages relating to this instance. (See SID X and SID Y in Figure A.2.) The NI uses the SID value to distribute messages to the correct AEI.



NOTE 1 – The Incoming ASE type is used.
NOTE 2 – The Outgoing ASE type is used.

Figure A.2/Q.2764 – Model of intermediate exchange

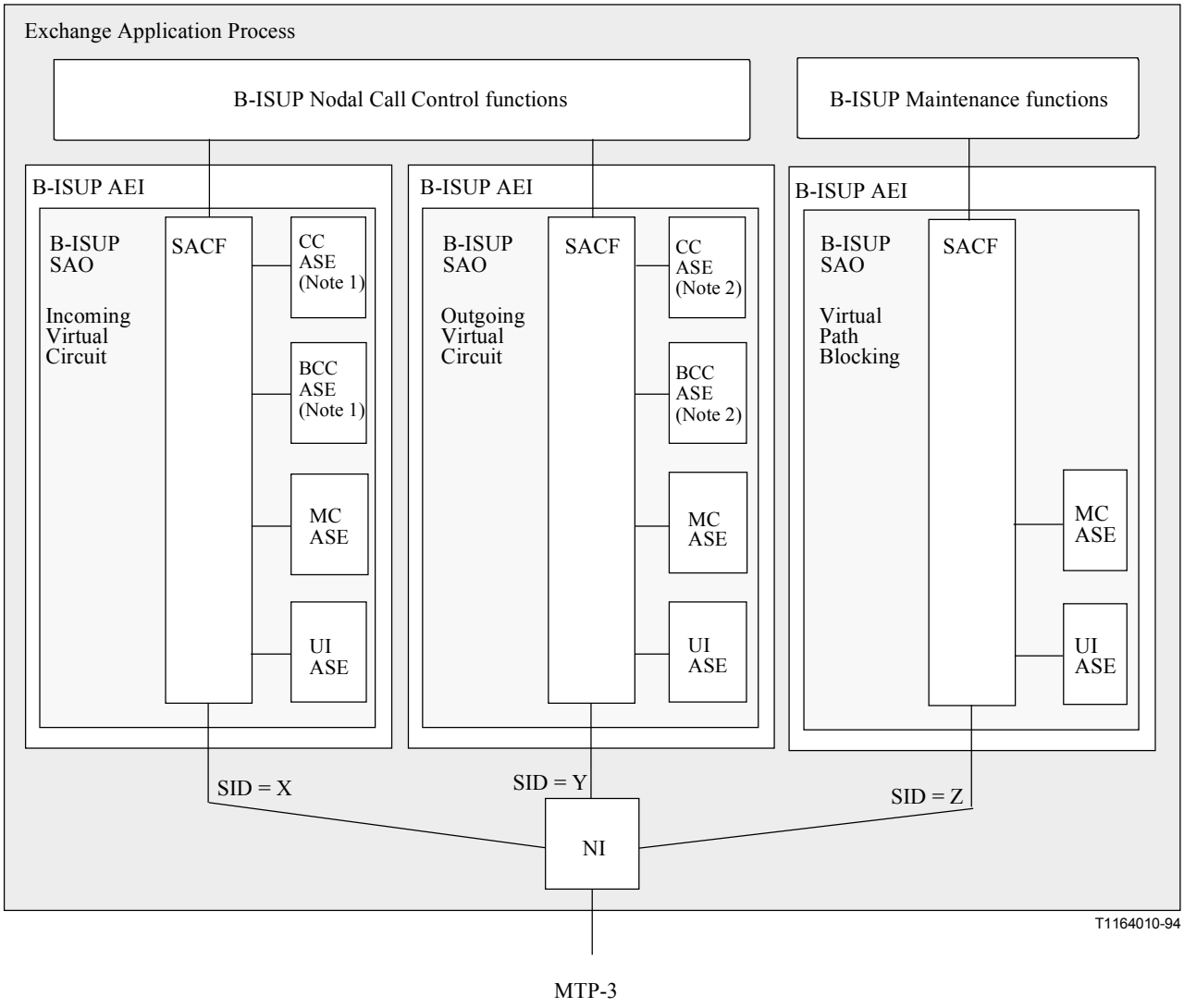
Figure A.3 shows an additional example where a maintenance function is in progress. The maintenance function is blocking a Virtual Path used by the call/connection in progress. In this case there can be interactions between the call/connection and the blocking procedure; the Exchange Application Process is assumed to perform appropriate communication/coordination functions to facilitate the required interactions.

A.3.1 Dynamic modelling aspects

The "Dynamic" aspects of the model are considered to be the mechanisms by which instances of the B-ISUP functions are created, and deleted, as required to provide a particular service.

A.3.1.1 Actions initiated by this Exchange

When a function in the Exchange Application Process decides that B-ISUP is required, e.g. B-ISUP is selected as the signalling system to be used for a call/connection outgoing from this exchange, it creates a new instance of B-ISUP. The B-ISUP Nodal functions will create an instance of B-ISUP AE for each signalling association required. The AEI created contains an SAO of the appropriate type, as listed in A.2.



NOTE 1 – The Incoming ASE type is used.
NOTE 2 – The Outgoing ASE type is used.

Figure A.3/Q.2764 – Model of intermediate exchange, plus maintenance

When the B-ISUP operation is complete, e.g. the call/connection is released, the B-ISUP instance, and any associated AEIs, are deleted.

A.3.1.2 Actions initiated by another Exchange

When a message is received at the MTP-3 Service Access Point, the Exchange Application Process attempts to distribute this to the correct AEI. It does this based on the Destination SID parameter in the message:

- If the Destination SID corresponds to an existing B-ISUP AEI, the message is distributed as described in A.3.2.
- If the Destination SID does not correspond to an existing B-ISUP AEI, an instance of B-ISUP, including an AEI, is created. The type of the SAO created is determined by examination of the received message type. (This is probably an error, and will be handled by the protocol machines in the AE.)
- If the message does not contain a Destination SID parameter, but it does contain an Origination SID parameter, a new instance of B-ISUP, including an AEI, is created. This

new instance is allocated a new SID value. The type of the SAO created is determined by examination of the received message type.

- If the message does not contain a Destination SID parameter or an Origination SID parameter, a protocol error has occurred.

When the B-ISUP operation is complete, e.g. the call/connection is released, the B-ISUP instance, and any associated AEIs, are deleted.

A.3.2 Static modelling aspects

The "Static" aspects of the model are considered to be the mechanisms by which existing instances of the B-ISUP signalling associations are used to provide a particular service.

A.3.2.1 Actions initiated by this Exchange

When a B-ISUP Nodal function requires to communicate to a peer entity in another exchange, it uses the services of the AEI supporting the appropriate signalling association.

Figure A.4 shows an example information flow for a message being sent from this exchange. In this example, the message is of Bearer Connection Control and Call Control significance.

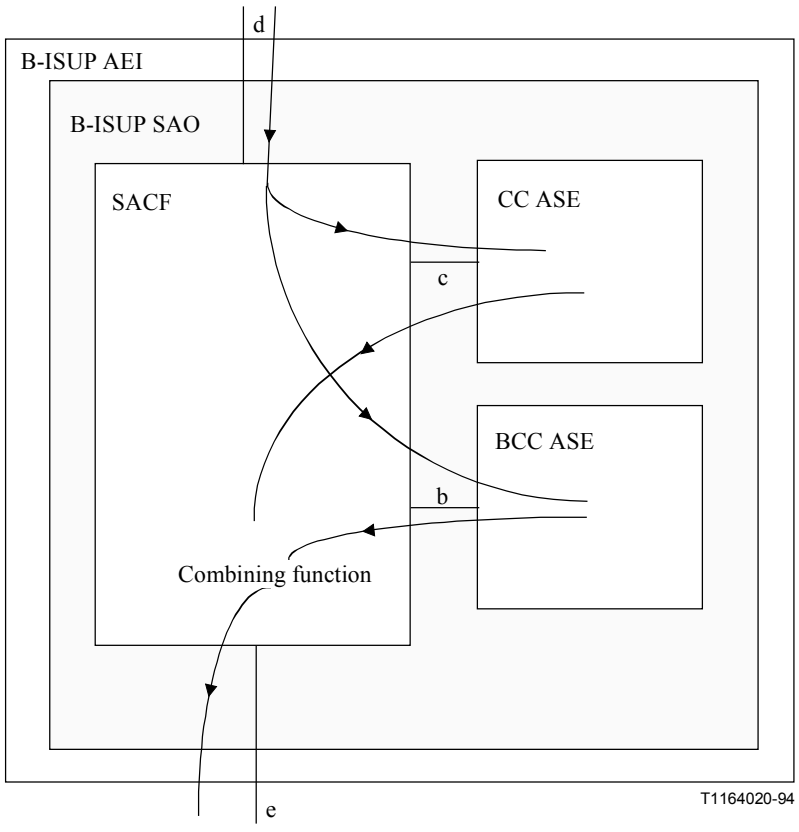


Figure A.4/Q.2764 – Example of SACF functions when sending a message

A.3.2.2 Actions initiated by another Exchange

When a message is received at the MTP-3 Service Access Point, the Exchange Application Process attempts to distribute this to the correct AEI. It does this based on the Destination SID parameter in the message:

- If the Destination SID corresponds to an existing B-ISUP AEI, the message is distributed to that AEI.

- For the other possible cases, see A.3.1.2.

Figure A.5 shows an example information flow for a message being received at this exchange. In this example, the message is of Bearer Control and Call Control significance.

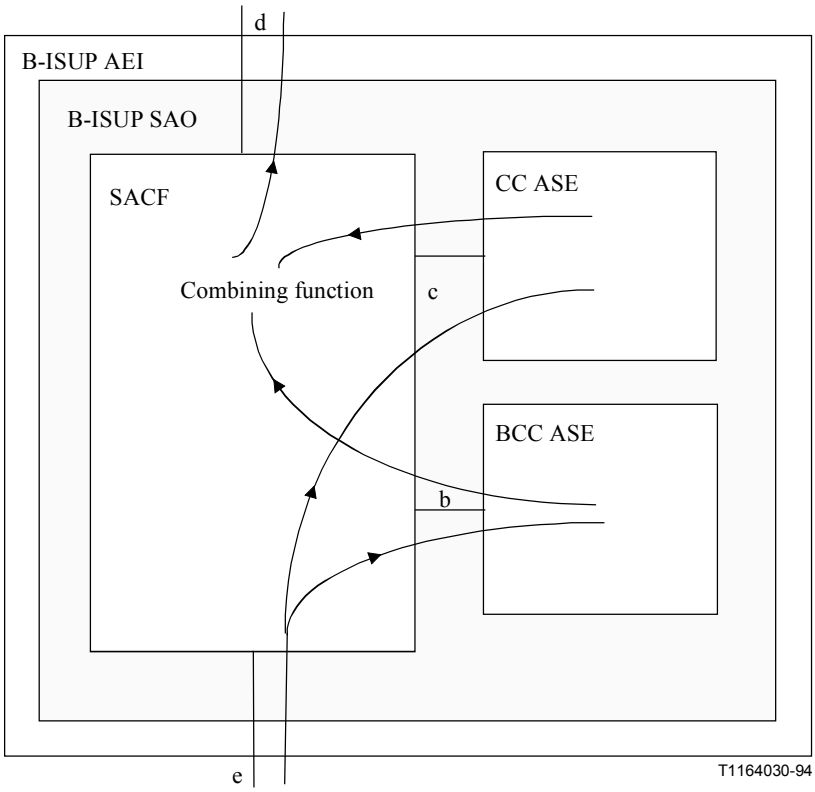


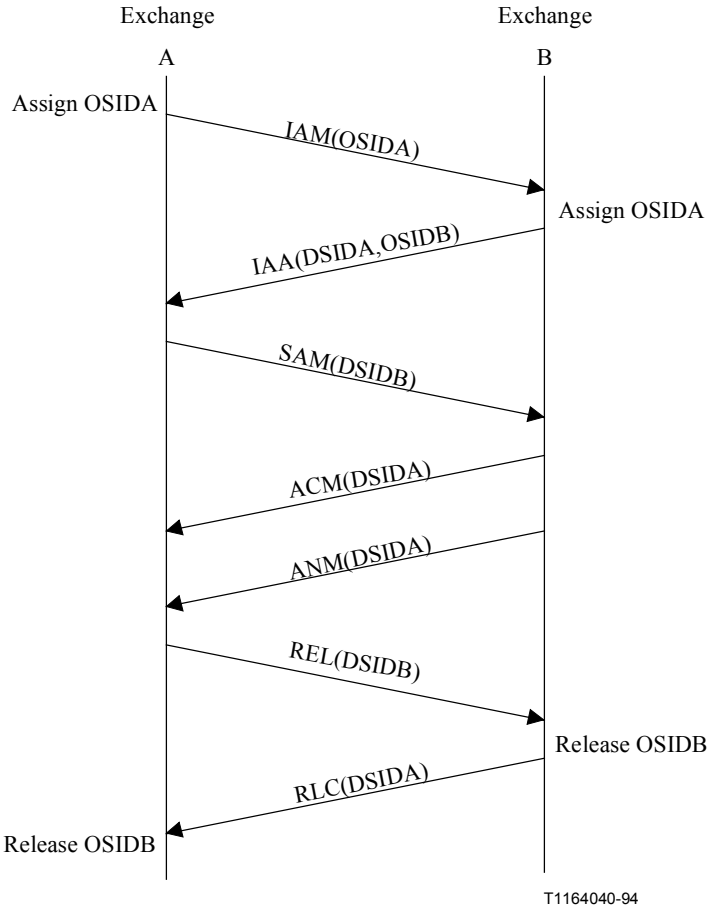
Figure A.5/Q.2764 – Example of SACF functions when receiving a message

ANNEX B

B-ISUP example message sequences

B.1 B-ISUP example call setup sequences

See Figures B.1 and B.2.



DSIDA Destination Signalling ID A (= OSIDA)
DSIDB Destination Signalling ID B (= OSIDB)
OSIDA Origination Signalling ID assigned by exchange A
OSIDB Origination Signalling ID assigned by exchange B

Figure B.1/Q.2764 – Example of a scenario for assigning and releasing of the signalling associations; only the SID-Parameters of the message are shown

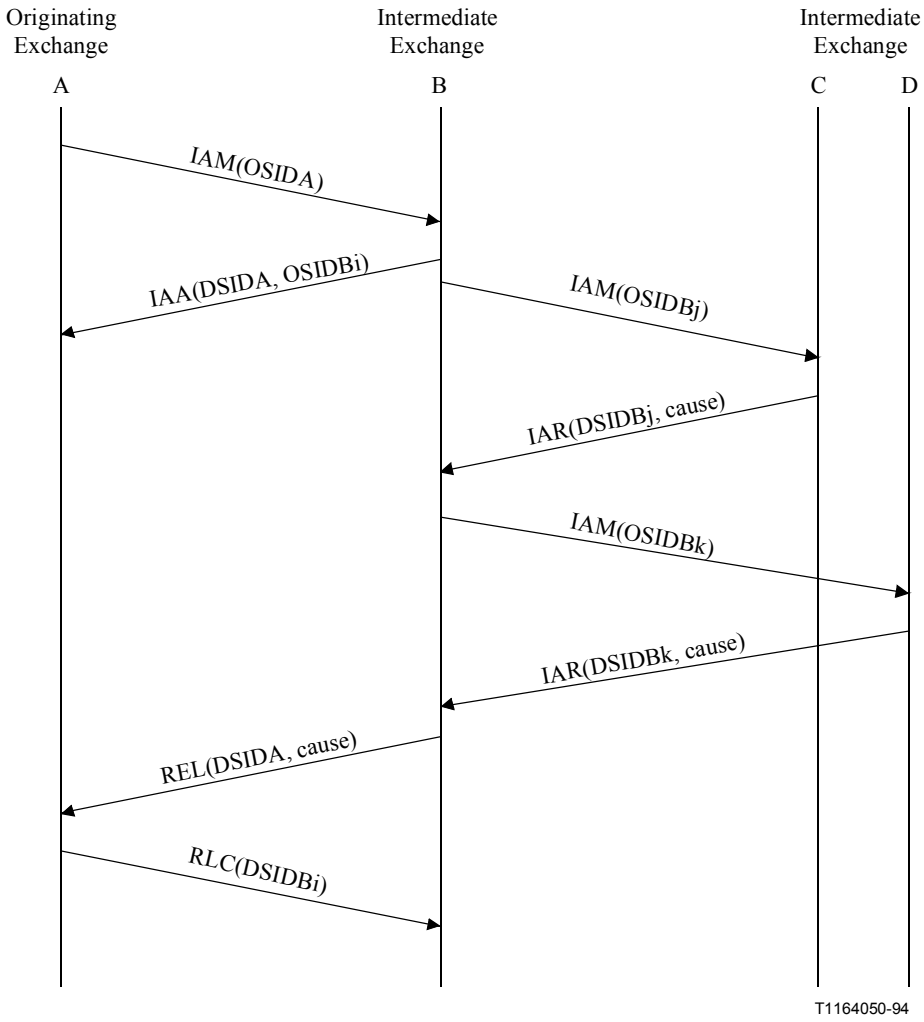


Figure B.2/Q.2764 – Example unsuccessful call/connection setup sequence

B.2 Example message flows for negotiation during call setup

See Figure B.3.

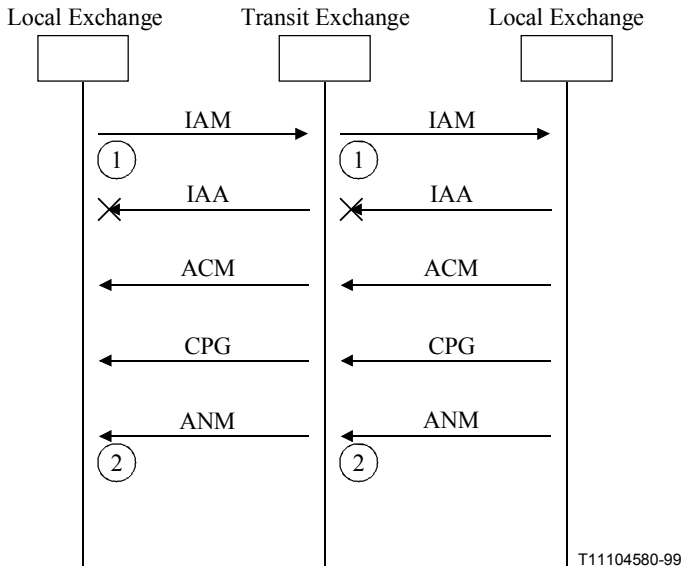


Figure B.3/Q.2764 – Example message flows for negotiation during call setup

1) If the original request cannot be supported, then the sending switch either:
   a) initiates setup using the non-assigning exchange procedure. The receiving switch may allocate resources based on the alternative or minimum ATM cell rate parameter; or
   b) uses the assigning exchange procedure and initiates setup with a reduced resource request based on the alternative ATM cell rate or minimum ATM cell rate parameter as applicable.
2) Switch modifies resource allocation based on the ATM cell rate parameter, and the additional ATM cell rate parameter if applicable, received in backwards direction, as appropriate.

B.3 Modification procedures

B.3.1 Example of successful modification sequence for decreasing bandwidth

See Figure B.4.

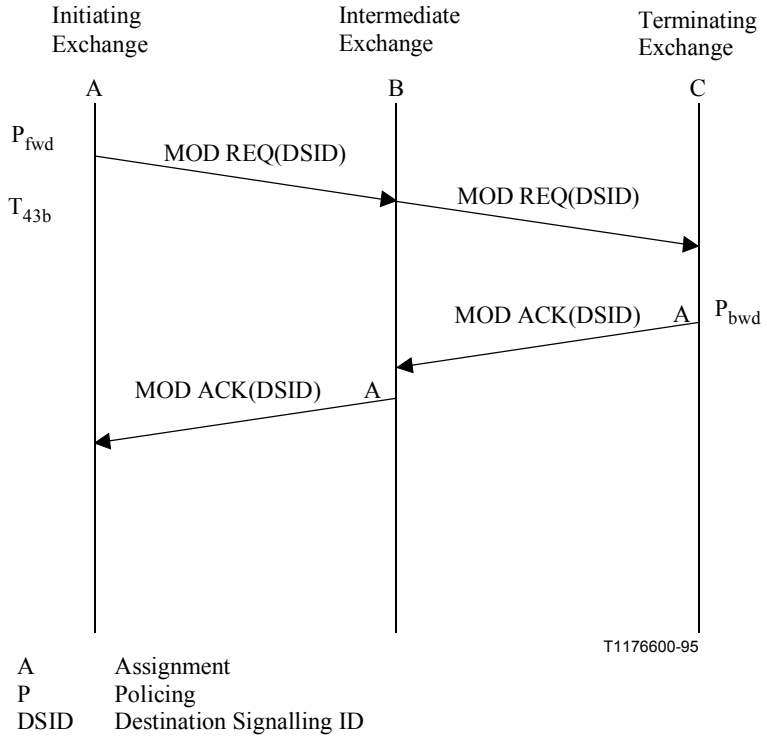


Figure B.4/Q.2764 – Example of successful modification for decreasing bandwidth

B.3.2 Example of unsuccessful modification sequence

See Figure B.5.

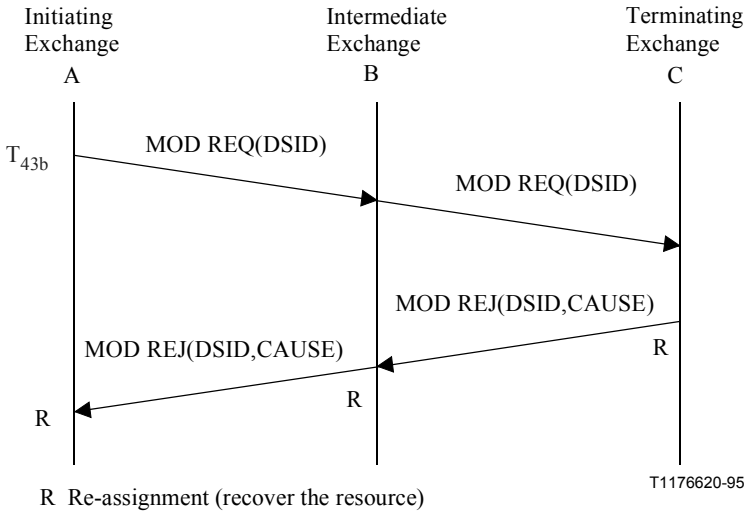


Figure B.5/Q.2764 – Example of unsuccessful modification sequence

B.4 Example modification procedures with negotiation

B.4.1 Example of successful modification with negotiation

See Figure B.6.

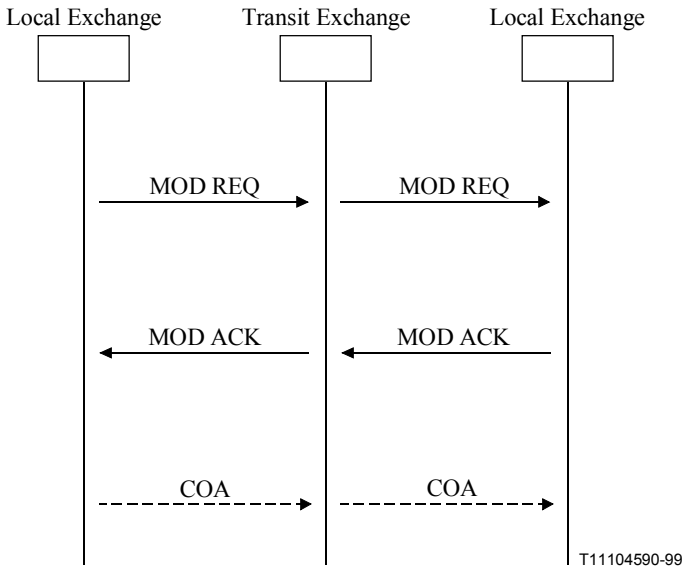


Figure B.6/Q.2764 – Example of successful modification with negotiation

B.4.2 Examples of unsuccessful modification with negotiation

See Figures B.7 to B.9.

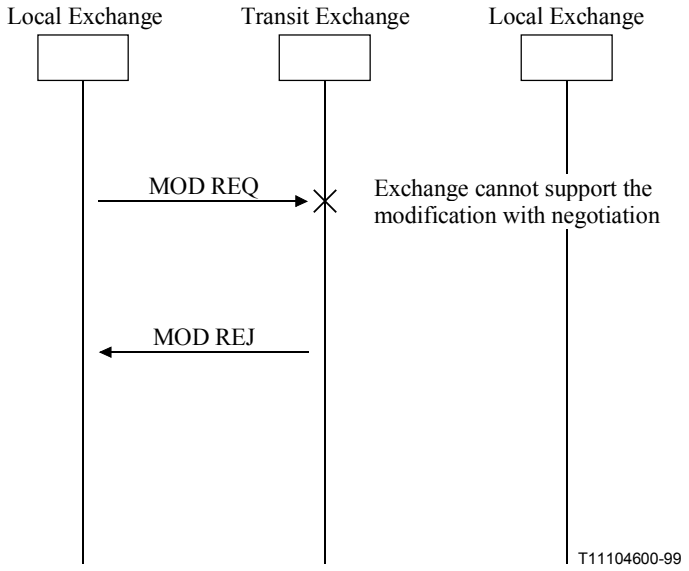


Figure B.7/Q.2764 – Example of unsuccessful modification with negotiation

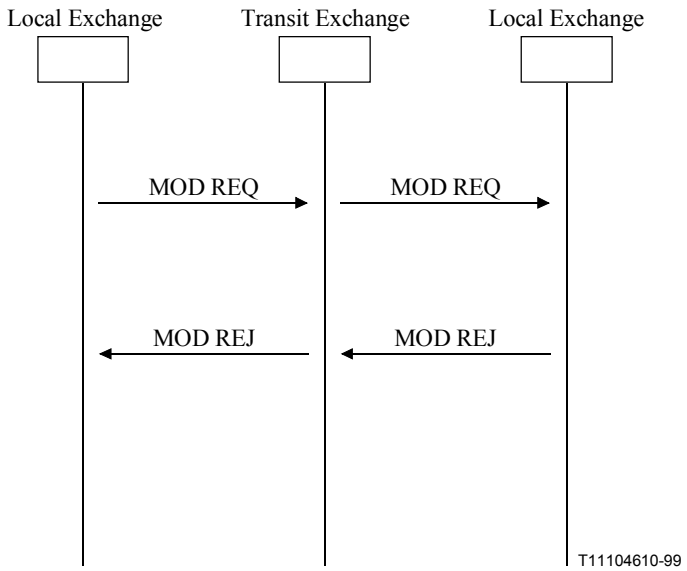


Figure B.8/Q.2764 – Example of unsuccessful modification with negotiation

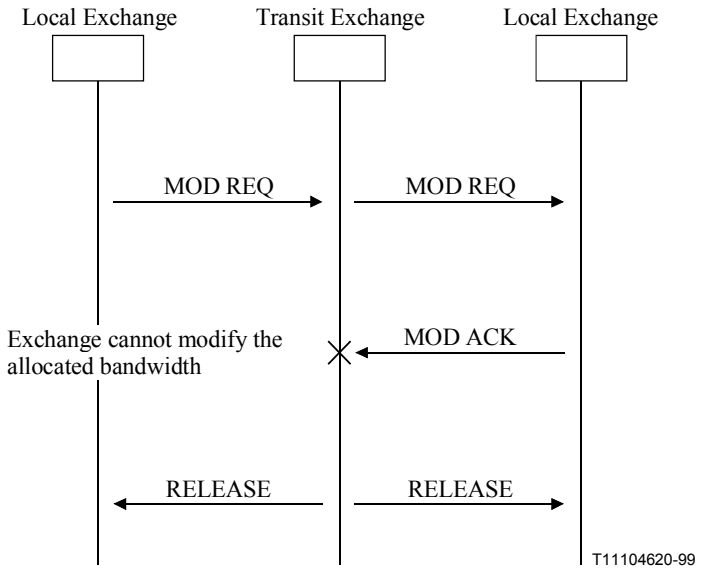


Figure B.9/Q.2764 – Example of unsuccessful modification with negotiation

ANNEX C

SDL overview

C.1 Introduction

This annex gives an overview of the structure of the SDL diagrams found in the various text references of this ITU-T Recommendation. (See Figures C.1 to C.5.)

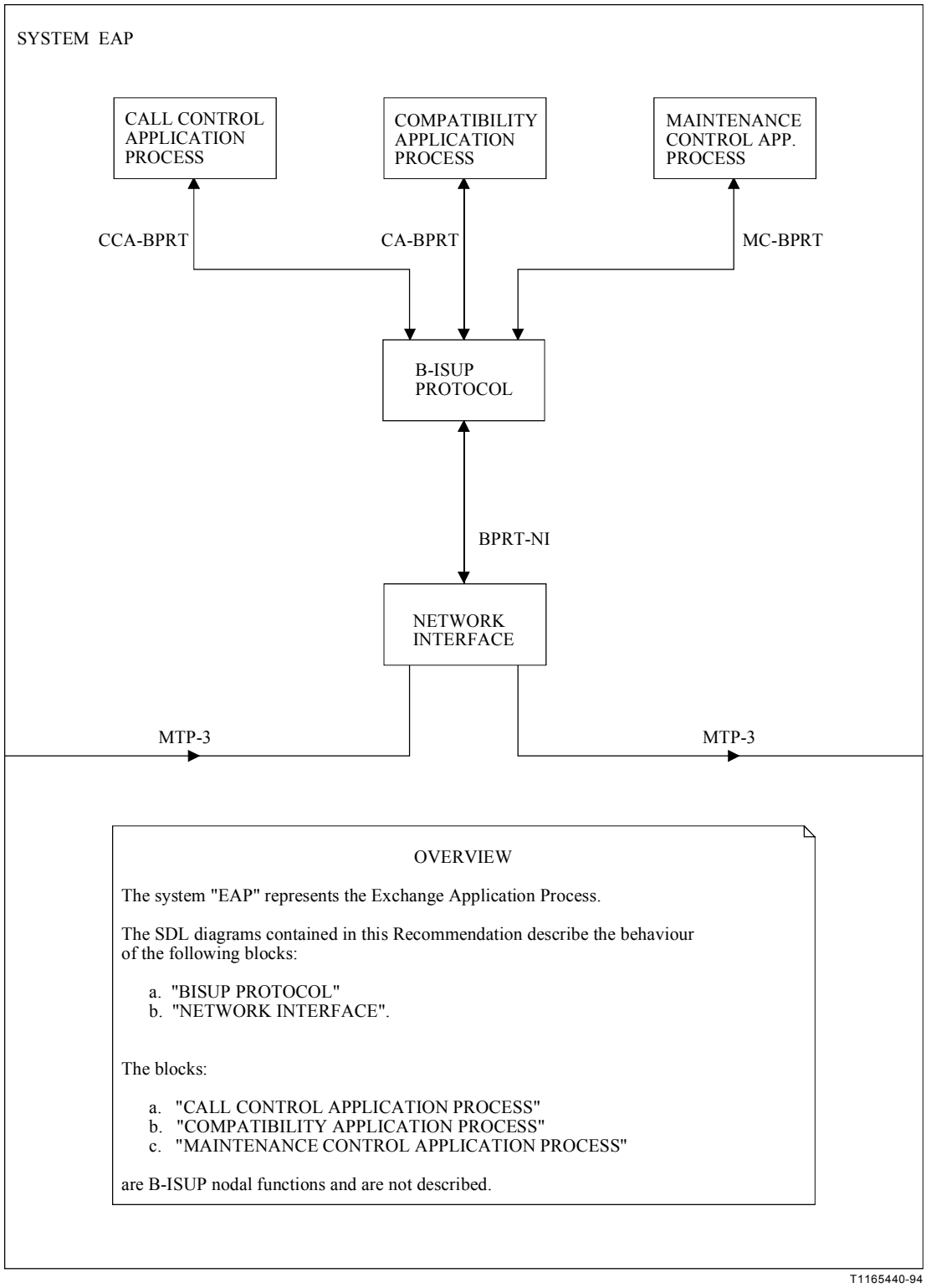


Figure C.1/Q.2764

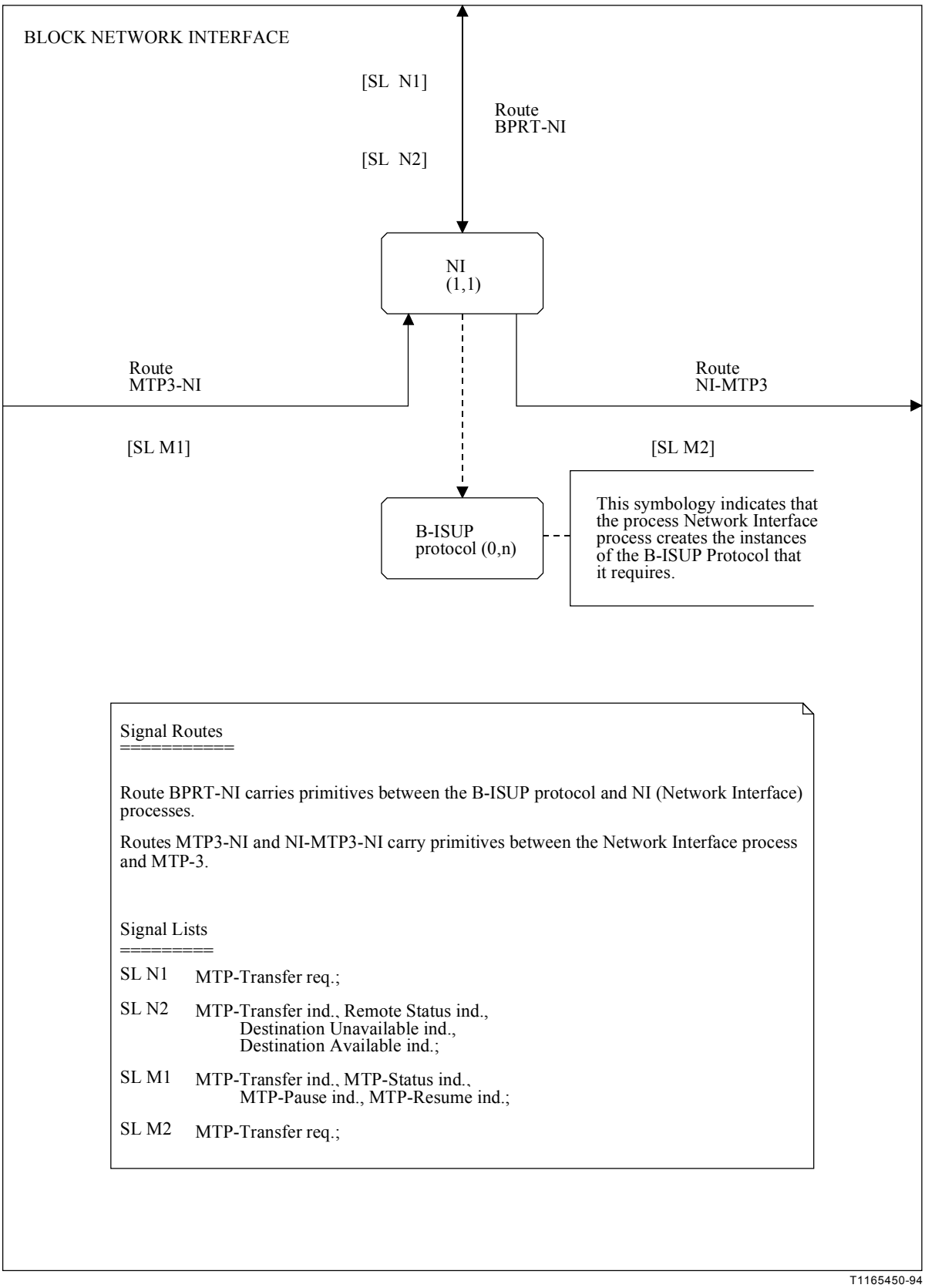


Figure C.2/Q.2764

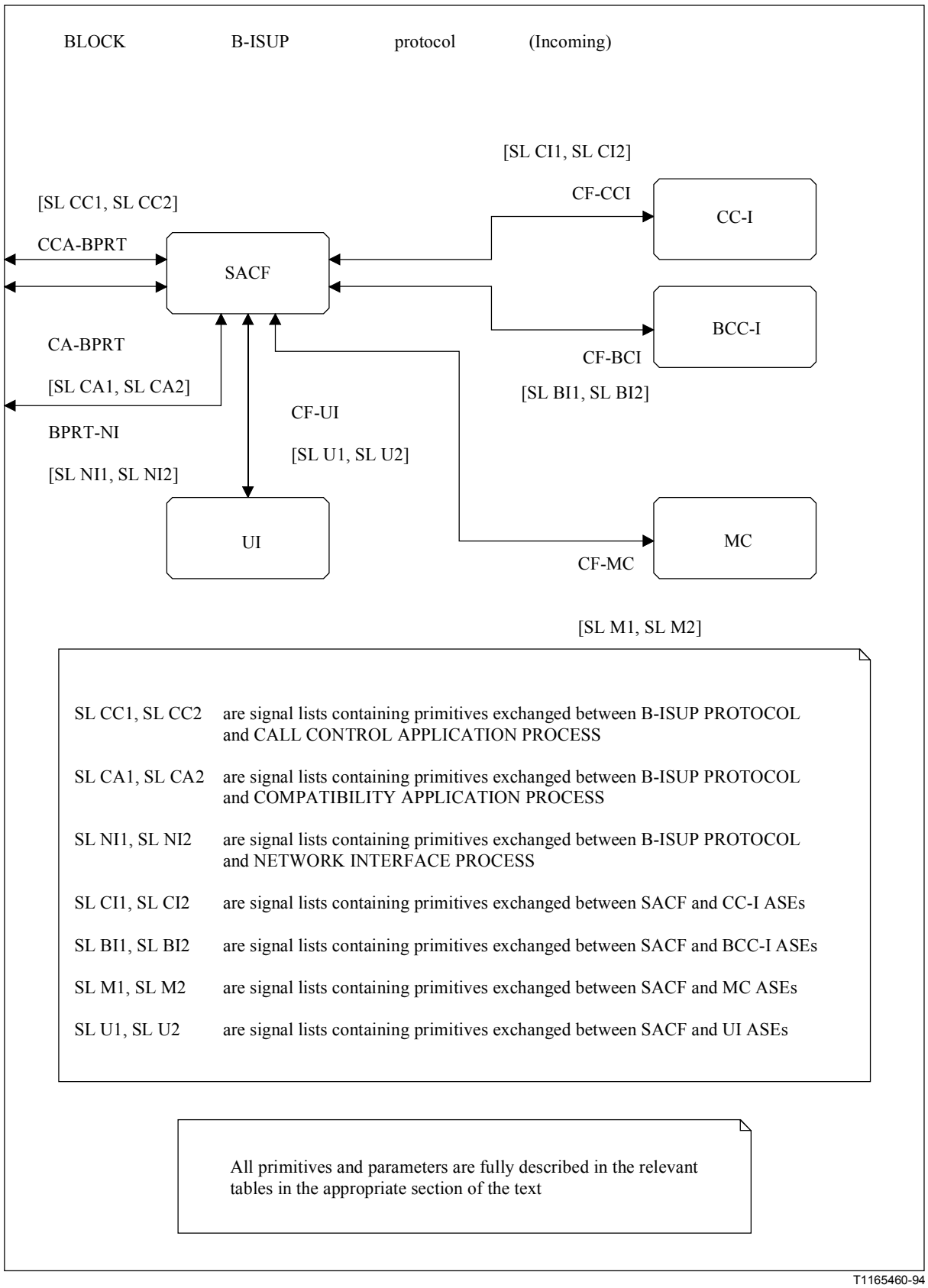


Figure C.3/Q.2764

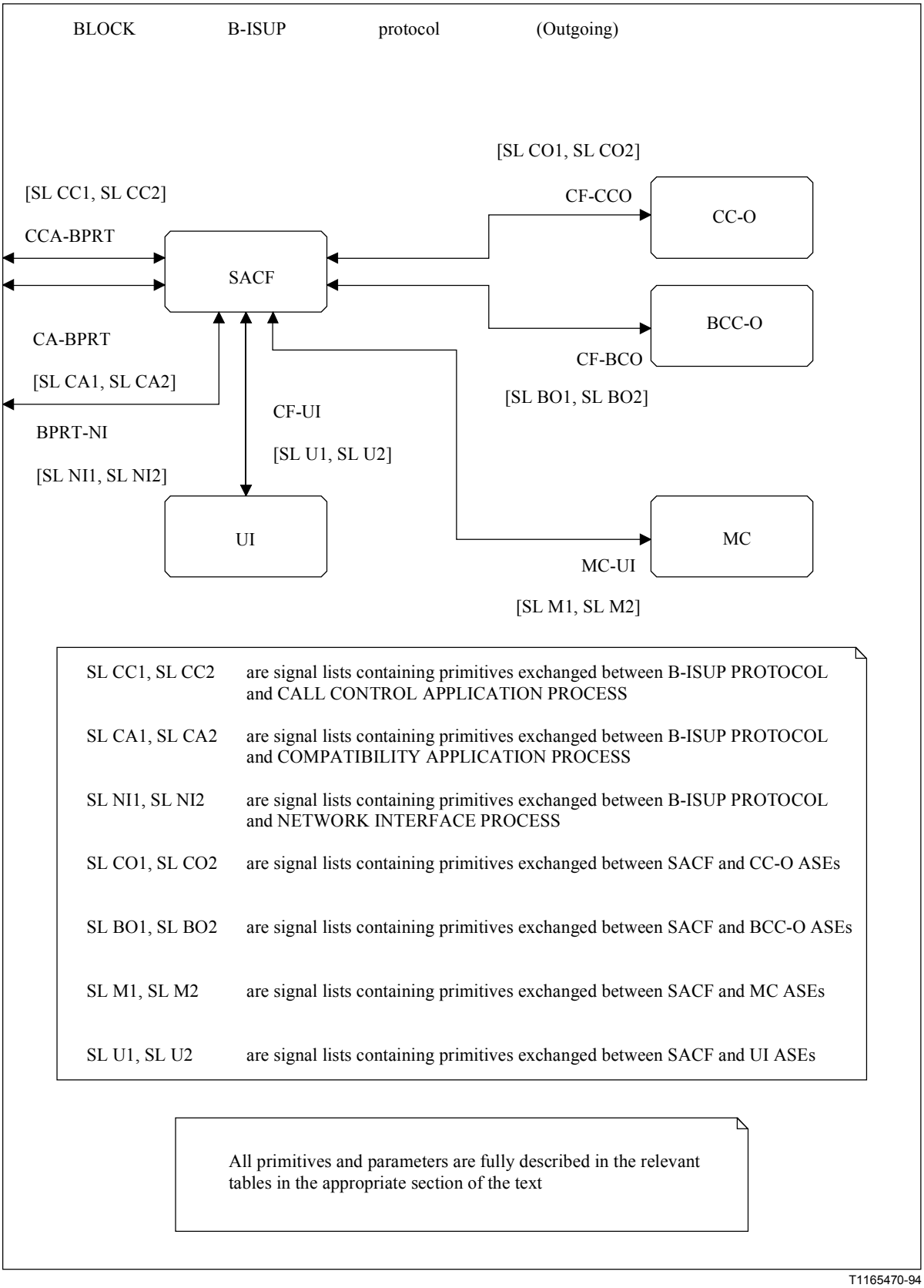


Figure C.4/Q.2764

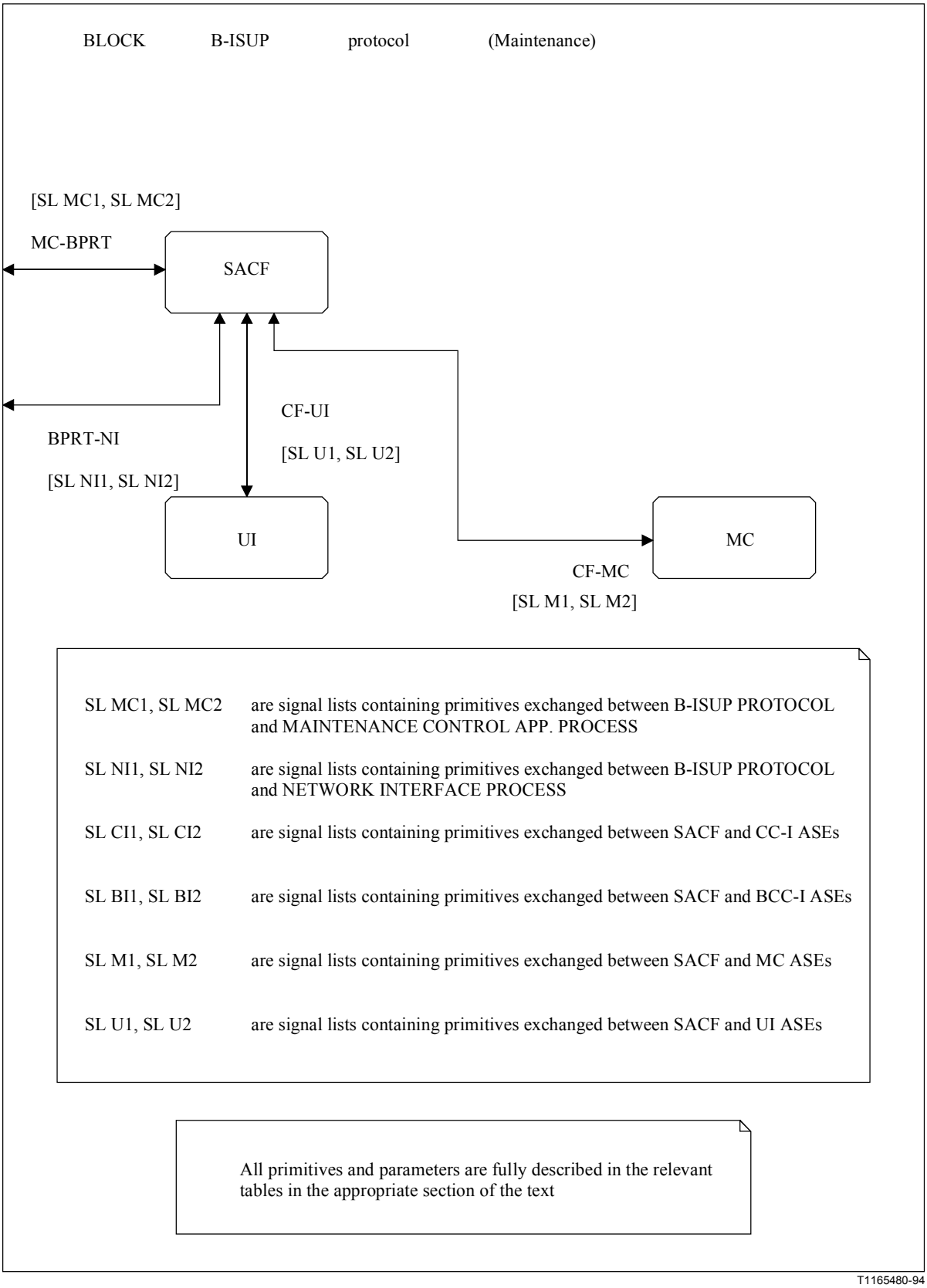


Figure C.5/Q.2764

APPENDIX I

Coding of the message compatibility information subfield

Table I.1 contains an example set of values for the Message Compatibility Information field of the messages relating to the Basic Call. Actual values used in an implementation may differ (i.e. deviations will not be a protocol error).

In Table I.1 a "default" entry means that the indicator is not examined due to the setting of a higher priority indicator.

The instruction indicators are designed to support graceful evolution of the protocol, hence for the initial release, the indicators for basic call messages and parameters shall not be consulted under normal operation.

Messages which are for national use are not described in this appendix.

Table I.1/Q.2764 – Example coding of the instruction indicators

Message	Broadband/ narrow-band interworking indicator	Pass on not possible indicator (octet 1)	Discard message indicator	Send notification indicator	Release call indicator	Transit at intermediate exchange indicator
Address complete	Pass on	Default	Default	Default	Release call	End node interpretation
Answer	Pass on	Default	Default	Default	Release call	End node interpretation
Blocking	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Blocking acknowledgement	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Call progress	Pass on	Discard message	Do not discard message	Do not send notification	Do not release call	Transit interpretation
Confusion	Pass on	Discard message	Do not discard message	Do not send notification	Do not release call	End node interpretation
Consistency check end	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Consistency check end acknowledgement	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Consistency check request	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Consistency check request acknowledgement	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Forward transfer	Discard message	Default	Discard message	Do not send notification	Do not release call	Transit interpretation
IAM acknowledgement	Release call	Default	Default	Default	Release call	End node interpretation
IAM reject	Release call	Default	Default	Default	Release call	End node interpretation
Initial address	Release call	Default	Default	Default	Release call	End node interpretation

Table I.1/Q.2764 – Example coding of the instruction indicators *(continued)*

Message	Broadband/ narrow-band interworking indicator	Pass on not possible indicator (octet 1)	Discard message indicator	Send notification indicator	Release call indicator	Transit at intermediate exchange indicator
Modify Request	Discard message	Default	Discard message	Send notification	Do not release call	End node interpretation
Modify Acknowledge	Discard message	Default	Discard message	Send notification	Do not release call	End node interpretation
Modify Reject	Discard message	Default	Discard message	Send notification	Do not release call	End node interpretation
Connection Available	Discard message	Discard message	Do not discard message	Do not send notification	Do not release call	Transit interpretation
Network resource management	Pass on	Discard message	Do not discard message	Do not send notification	Do not release call	End node interpretation
Pre-Release Information	Pass on	Discard message	Do not discard message	Do not send notification	Do not release call	Transit interpretation
Release	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Release complete	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Reset	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Reset acknowledgement	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Resume	Discard message	Discard message	Do not discard message	Do not send notification	Do not release call	Transit interpretation
Segmentation (national use)	Pass on	Discard message	Do not discard message	Do not send notification	Do not release call	Transit interpretation
Subsequent address	Release call	Default	Default	Default	Release call	End node interpretation
Suspend	Discard Message	Discard message	Do not discard message	Do not send notification	Do not release call	Transit interpretation
User-to-User information	Discard message	Discard message	Do not discard message	Do not send notification	Do not release call	Transit interpretation
Unblocking	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Unblocking acknowledgement	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation

Table I.1/Q.2764 – Example coding of the instruction indicators *(concluded)*

Message	Broadband/ narrow-band interworking indicator	Pass on not possible indicator (octet 1)	Discard message indicator	Send notification indicator	Release call indicator	Transit at intermediate exchange indicator
User part available	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
User part test	Discard message	Default	Discard message	Do not send notification	Do not release call	End node interpretation
Default = 0 value for the subfield. NOTE – "Release Call" in the context of maintenance messages means that the corresponding (maintenance) B-ISUP AEI is terminated but no further action is performed.						

APPENDIX II

Coding of the parameter compatibility information subfield

Table II.1 contains an example set of values for the Parameter Compatibility Information field of the parameters relating to the Basic Call. Actual values used in an implementation may differ (i.e. deviations will not be a protocol error).

In Table II.1 a "default" entry means that the indicator is not examined due to the setting of a higher priority indicator.

The instruction indicators are designed to support graceful evolution of the protocol, hence for the initial release, the indicators for basic call messages and parameters shall not be consulted under normal operation.

Parameters which are for national use are not described in this appendix.

General principles applied in this appendix

II.1 Transit at intermediate exchange indicator

The value of this subfield depends on whether a Type B-exchange should interpret the corresponding parameter or not.

II.2 Send notification indicator

The coding of this indicator can only be decided on a service basis by the exchange initiating the service, which can judge if some kind of notification can help the correct handling of the service if a message or parameter has been discarded.

II.3 Discard parameter indicator, discard message indicator, release call indicator, pass on not possible indicator

– If not only Type B-exchanges but also most Type A-exchanges (which means incoming and outgoing international exchanges) need not interpret the content of a parameter (these parameters are some of optional parameters), the parameter compatibility information of the parameter is set indicating "pass on".

– If some exchanges (type A-exchanges or Type A- and B-exchanges, which depend on the value of Transit at intermediate exchange indicator) have to interpret the content of a parameter, and even if without the parameter, the exchanges can continue processing the

message with possibly affecting service (these parameters are some of optional parameters), the parameter compatibility information of the parameter is set indicating "discard parameter".

– If some exchanges (type A-exchanges or Type A- and B-exchanges, which depend on the value of Transit at intermediate exchange indicator) cannot continue processing the message completely without a parameter (these parameters are mandatory parameters), the parameter compatibility information of the parameter is set indicating "release call".

II.4 Broadband/Narrow-band interworking indicator

– Broadband parameters which have the same parameter name, format and coding as a corresponding narrow-band parameter shall be passed on, if the parameter does not need to be interpreted.

– Broadband parameters which do not have any correspondence with narrow-band parameters (i.e. they are broadband specific) shall be discarded, if the parameter does not need to be interpreted.

Table II.1/Q.2764 – Example coding of the instruction indicators

Parameter	Pass on not possible indicator	Discard parameter indicator	Discard message indicator	Send notification indicator	Release Call indicator	Transit at intermediate exchange indicator	Broadband/ narrow-band interworking indicator
AAL parameters	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
AAL prime parameters	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit node interpretation	Discard parameter
AESA for called party	Default	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit node interpretation	Discard parameter
Additional ATM cell rate	Release call	Default	Default	Default	Release call	Transit node interpretation	Release call
Access delivery information	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
ATC setup parameters	Default	Default	Default	Default	Release call	End node interpretation	Release call
ATM cell rate	Default	Default	Default	Default	Release call	End node interpretation	Release call
Alternative ATM cell rate	Default	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Release call
Automatic congestion level	Default	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Discard parameter
Automatic Re-routing	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Discard parameter
Backward narrow-band interworking indicator	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Release call

Table II.1/Q.2764 – Example coding of the instruction indicators *(continued)*

Parameter	Pass on not possible indicator	Discard parameter indicator	Discard message indicator	Send notification indicator	Release Call indicator	Transit at intermediate exchange indicator	Broadband/ narrow-band interworking indicator
Broadband bearer capability	Default	Default	Default	Default	Release call	End node interpretation	Release call
Broadband high layer information	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Broadband low layer information	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Call diversion information	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Call diversion may occur	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Call history information	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Called party number	Default	Default	Default	Default	Release call	End node interpretation	Release call
Called party's indicators	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Release call
Calling party's category	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Release call
Cause indicators	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Pass on
CDVT	Default	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Discard parameter
Charge indicator	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Connection element identifier	Default	Default	Default	Default	Release call	End node interpretation	Release call
Consistency check result information	Default	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Discard parameter
Destination signalling identifier	Default	Default	Default	Default	Release call	End node interpretation	Release call
Echo control information	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter

Table II.1/Q.2764 – Example coding of the instruction indicators *(continued)*

Parameter	Pass on not possible indicator	Discard parameter indicator	Discard message indicator	Send notification indicator	Release Call indicator	Transit at intermediate exchange indicator	Broadband/ narrow-band interworking indicator
End-to-end transit delay network generated indicator	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit node interpretation	Discard parameter
Exclusive connection element identifier	Default	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Discard parameter
Extended Quality of Service parameter	Discard parameter	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Discard parameter
Forward narrow-band interworking indicator	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Release the call
Hop Counter	Default	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
In-band information indicator	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Link layer core parameters	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Link layer protocol parameters	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Location number	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Maximum end-to-end transit delay	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Discard parameter
Minimum ATM cell rate	Default	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Release call
MLPP precedence	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Narrow-band bearer capability	Default	Default	Default	Default	Release call	End node interpretation	Release call
Narrow-band high layer compatibility	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Narrow-band low layer compatibility	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter

Table II.1/Q.2764 – Example coding of the instruction indicators *(continued)*

Parameter	Pass on not possible indicator	Discard parameter indicator	Discard message indicator	Send notification indicator	Release Call indicator	Transit at intermediate exchange indicator	Broadband/ narrow-band interworking indicator
National/ international call indicator	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Release call
Notification	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
OAM traffic descriptor	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Original called number	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Origination ISC point code	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Origination signalling identifier	Default	Default	Default	Default	Release call	End node interpretation	Release call
Progress indicator	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Quality of service	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	(Note)	End node interpretation	Discard parameter
Redirecting number	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Redirection information	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Redirection number	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Report Type	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Report Type Prime	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Discard parameter
Resource identifier	Default	Default	Default	Default	Release call	End node interpretation	Release call
Subsequent number	Default	Default	Default	Default	Release call	End node interpretation	Release call
Suspend/ Resume indicators	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Temporary Alternative Routing	Default	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on

Table II.1/Q.2764 – Example coding of the instruction indicators *(concluded)*

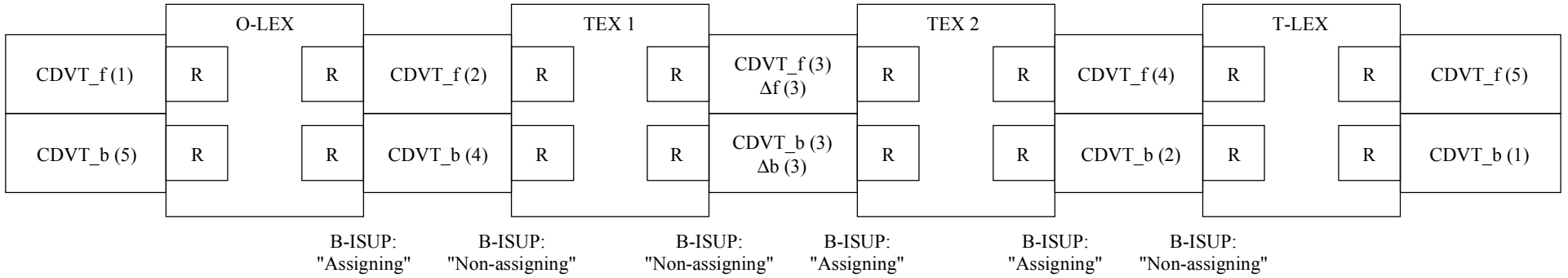
Parameter	Pass on not possible indicator	Discard parameter indicator	Discard message indicator	Send notification indicator	Release Call indicator	Transit at intermediate exchange indicator	Broadband/ narrow-band interworking indicator
User-to-User information	Discard parameter	Do not discard parameter	Do not discard message	Do not send notification	Do not release call	Transit interpretation	Pass on
Default = 0 value for the subfield. NOTE – The instruction indicators shall be set to release the call when there is no coincidence between the explicit QoS class and the implicit QoS class 0 and shall be set to pass on the call when there is coincidence between the explicit QoS class and the implicit QoS class 0.							

APPENDIX III

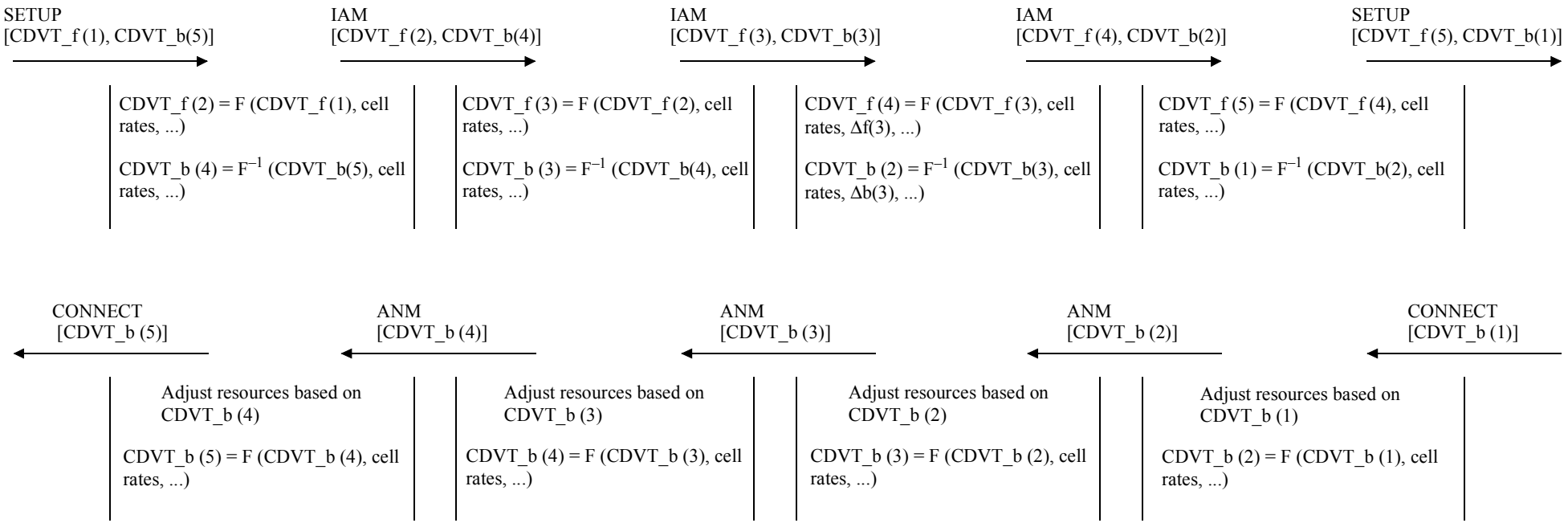
Illustration of the CDVT indication procedures

Figure III.1 illustrates the CDVT indication procedures.

R Resource Mgmt.



F a suitable function based on the RM calculations and shaping if this function is applied.
If shaping is applied then forward CDVT values sent are not necessarily increased with regard to those received and backward CDVT values are not necessarily decreased.



NOTE – Δf(.) and Δb(.) values are required only for Option 1 of the VPI/VPCI and bandwidth assignment procedures.

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Figure III.1/Q.2764 – Illustration of the CDVT indication procedures (only SETUP/IAM and CONNECT/ANM are shown)

APPENDIX IV

AESA routing examples

IV.1 E.164 AESA

In the example shown in Figure IV.1, the originating network maps the Called party number IE received in the SETUP to the AESA for called party parameter and, in addition, maps the Initial Domain Identifier (E.164 part) of the AESA to the Called party number parameter. The destination network receives an IAM with both an E.164 address in the Called party number (CdPN) parameter and the E.164 AESA in the AESA for called party parameter. The destination network may use one or both of these parameters to determine the UNI to which to deliver the call.

At the terminating UNI, the AESA for called party (AESA CdP) parameter is used to populate the Called party number IE in the SETUP.

If the terminating UNI does not support the AESA for called party parameter, the E.164 number in the Called party number parameter is used to map to the Called party number IE.

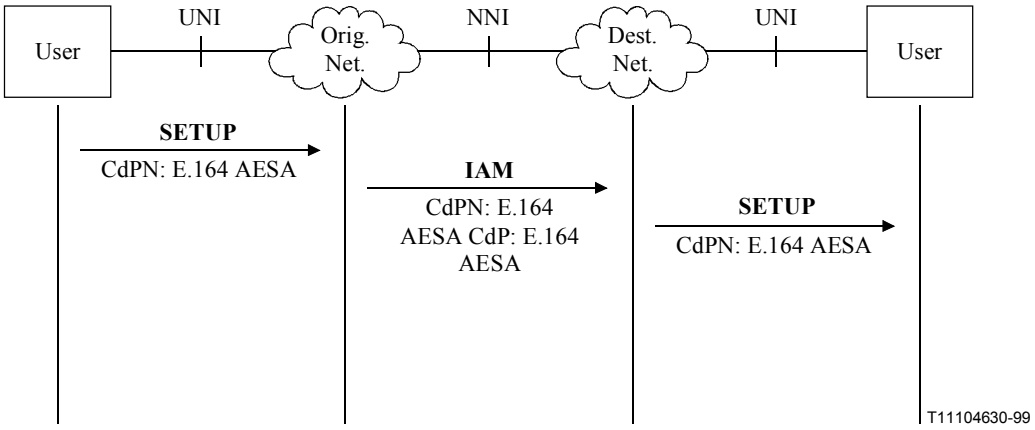

Figure IV.1/Q.2764 – Mapping of the IDI at the originating network

IV.2 Non-E.164 AESA

IV.2.1 E.164 Called party number required

In the example shown in Figure IV.2, the originating network performs a translation from a non-E.164 AESA format to an E.164 address. The destination network receives an IAM with both an E.164 address in the Called party number (CdPN) parameter and a non-E.164 AESA in the AESA for called party parameter. The destination network may use one or both of these parameters to determine the UNI to which to deliver the call.

At the terminating UNI, the AESA for called party (AESA CdP) parameter is used to populate the Called party number IE in the SETUP.

If the terminating UNI does not support the AESA for called party, the E.164 number, if present, in the Called party number parameter is used to map to the Called party number IE.

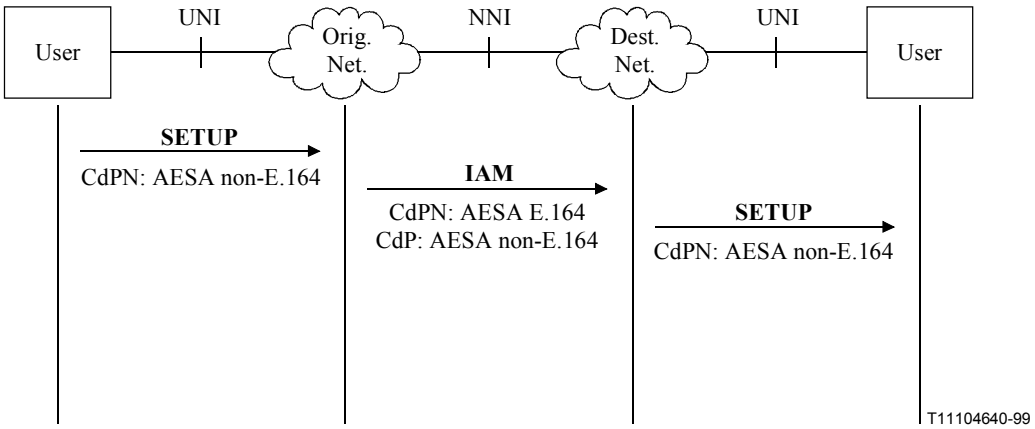

Figure IV.2/Q.2764 – Translation at the originating network

IV.2.2 Originating network using TNS

In the scenario shown in Figure IV.3, the originating network does not translate a non-E.164 AESA to produce an E.164 number for the Called party number parameter, but rather uses the Transit Network Selection (TNS) IE received in the SETUP to deliver the call to the carrier specified by the TNS. A non-E.164 AESA in the Called party number IE along with the TNS IE will be mapped into an IAM containing the AESA in the AESA for called party parameter and a Called party number parameter with no address digits. Note that the TNS is removed by the originating network before the call is routed to the transit network. In this example the transit network and destination network are the same, i.e. the terminating UNI is on the transit/destination network.

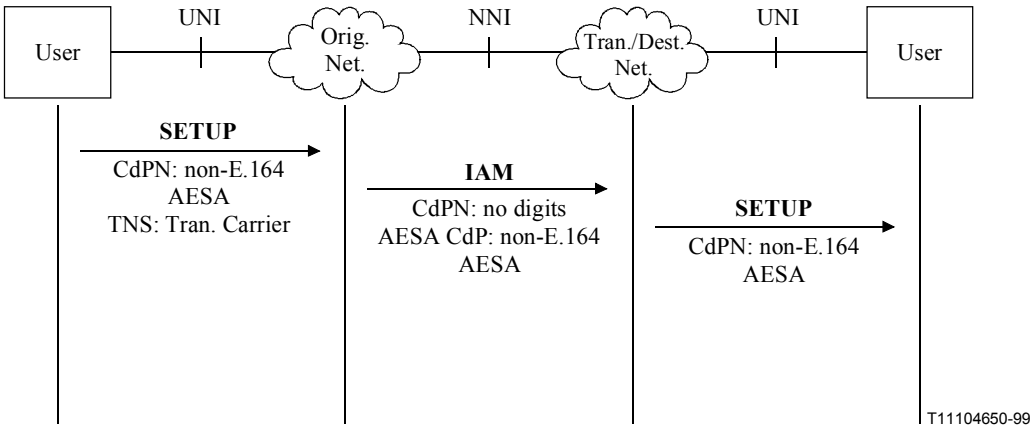

Figure IV.3/Q.2764 – Originating network uses TNS

IV.2.3 E.164 Called party number not required

In the scenario shown in Figure IV.4, the originating network does not translate a non-E.164 AESA to produce an E.164 number for the Called party number parameter, but rather codes the Called party number parameter to have no digits and maps the AESA octets into the AESA for called party parameter. In this example, the originating network delivers the call to the destination network, which is also capable of call setup using non-E.164 AESAs.

Once the call is received at the destination network, the AESA for called party parameter is used to deliver the call to the terminating UNI. At the terminating UNI, the AESA for called party parameter is used to populate the Called party number IE in the SETUP.

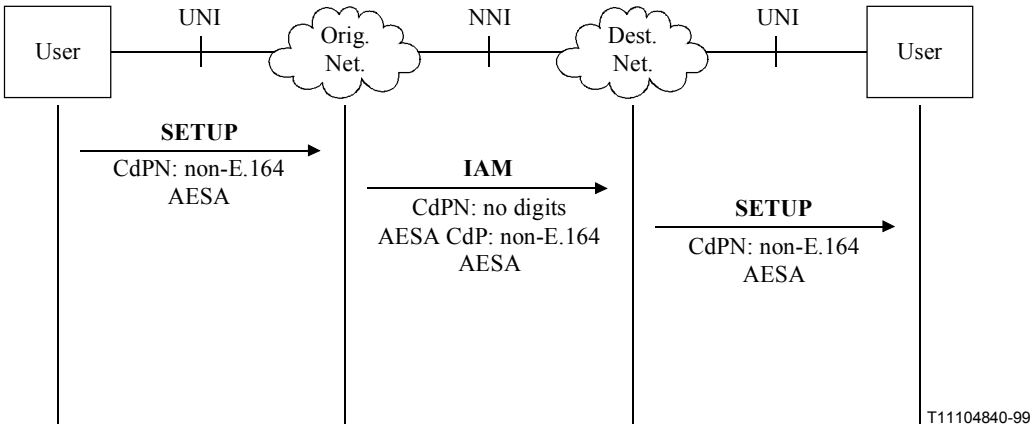

Figure IV.4/Q.2764 – Originating network generates CdPN with no digits

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