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FOREWORD

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Recommendation Q.2764

BROADBAND INTEGRATED SERVICES DIGITAL NETWORK (B-ISDN) – SIGNALLING SYSTEM No. 7 B-ISDN USER PART (B-ISUP) – BASIC CALL PROCEDURES

(Geneva, 1995)

1 General

1.1 Scope

This Recommendation describes the basic B-ISDN User Part signalling procedures for the set-up and cleardown of national and international B-ISDN Capability Set 1 network connections.

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 Recommendation relate to B-ISDN Signalling Capability Set 1 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

For the purposes of this Recommendation, the following abbreviations are used:

AE	Application Entity
AEI	Application Entity Instance
AP	Application Process
ASE	Application Service Element
ATM	Asynchronous Transfer Mode
BCC	Bearer Connection Control
B-ISDN	Broadband Integrated Services Digital Network
B-ISUP	B-ISDN User Part

CC	Call Control
CEI	Connection Element Identifier
MC	Maintenance Control
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
SACF	Single Association Control Function
SAO	Single Association Object
SDL	Specification and Description Language
SID	Signalling Identifier
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 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 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, 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 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.

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

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 Recommendation Q.2763) and in the proper sequence (as specified in this Recommendation.)

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

Figures included in Annex B show examples for call set-up 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.

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
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	–

Tables 2-2 to 2-14 (see 2.8) list the mandatory and optional contents for these primitives for the set-up and release of basic call/connections.

2.1.2 Assignment procedure of VPCI/VCI and bandwidth

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

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

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.

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 which the exchange is controlling, the exchange issues a Set_Up request without the Connection Element Identifer parameter.

2.1.2.2 Assignment procedure of VPCI/VCI and bandwidth

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 ATM Cell Rate.
   - 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.

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 "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 "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 "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 "VPCI/VCI assignment failure".

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 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.

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 Recommenda-tion 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, Broadband Bearer Capability, Broadband Low Layer Information, Broadband High Layer Information, Narrow-band High Layer Compatibility, Narrow-band Low layer Compatibility, 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.

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

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.

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.

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*

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.

b) *Non-assigning exchange*

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.

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*

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.

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 3.1kHz 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.

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.

- 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 Recommendation Q.2650.

2.2.1.7 Called party number for operator calls

International gateways should support access to operators equipment as specified in 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.

NOTES

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 Recommendation Q.107).

2 The incoming operator or the delay operator may be obtained by using a special number (see Recommenda-tion 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 Recommendation Q.107) or access code N1 ... Nn based on bilateral agreements;

– sending finished: ST.

Calling party category:

- “test call”

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

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

2.2.2 Forward address signalling – Overlap operation

2.2.2.1 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).

2.2.2.2 Actions required at an intermediate national exchange

2.2.2.2.1 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*

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. The Connection Element Identifier parameter is not included.

2.2.2.2.2 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 are 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 2.2.2.1 d).

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

See 2.2.2.1 e).

d) *Completion of transmission path*

See 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 2.2.1.2.1.

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, and Subsequent_Address request primitives – Issued by the assigning exchange*

See 2.2.2.1 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.

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

See 2.2.2.1 e).

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 2.2.1.2.1.

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, and Subsequent_Address request primitives – Issued by the assigning exchange*

See 2.2.2.1 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 2.2.2.1 e).

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 2.2.1.2.1.

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, and Subsequent_Address request primitives – Issued by the assigning exchange*

See 2.2.2.1 d).

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

See 2.2.2.1 e).

d) *Completion of transmission path*

See 2.2.1.2.2 d).

2.2.2.6 Actions required at the destination exchange

See 2.2.1.6.

2.2.2.7 Called party number for operator calls

See 2.2.1.7.

2.2.2.8 Called number for calls to testing and measuring devices

See 2.2.1.8.

2.2.3 Address_Complete request primitive

2.2.3.1 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 2.2.4).

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 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.

2.2.3.2 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.

2.2.3.3 Actions required at an outgoing international exchange

See 2.2.3.2. 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 "No answer from user (user alerted)".

2.2.3.4 Actions required at an intermediate international exchange

See 2.2.3.2.

2.2.3.5 Actions required at an incoming international exchange

See 2.2.3.2.

2.2.3.6 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 = "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 2.2.3.1, it is transferred unaltered in the indication returned to the calling user.

2.2.3.7 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 2.2.5.

2.2.3.8 Access delivery indication

In case the destination exchange delivered any call/connection set-up 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.

2.2.4 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 set-up which should be relayed to the calling party.

See also 2.3.6, Tones and Announcements.

2.2.4.1 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 2.2.3.7.

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, Progress Indicator parameter.

2.2.4.2 Actions required at an intermediate exchange

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

2.2.4.3 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 2.2.4.1, it is transferred unaltered in the indication returned to the calling user.

2.2.5 Answer primitive

2.2.5.1 Actions required at the destination exchange

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.

Through connection: see 2.2.3.7.

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 parameter, OAM Traffic Descriptor.

2.2.5.2 Actions required at an intermediate national exchange

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

2.2.5.3 Actions required at an outgoing international exchange

See 2.2.5.2. Additionally if the Answer indication is received subsequent to an Address Complete indication timer, “Await Answer” is stopped.

2.2.5.4 Actions required at an intermediate or incoming international exchange

See 2.2.5.2.

2.2.5.5 Actions required at the originating exchange

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 2.2.5.1, it is transferred unaltered in the indication returned to the calling user.

2.2.6 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).

2.2.7 Transit network selection (national option)

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

2.2.8 Storage and release of information

Each exchange of the connection shall store during the call/connection set-up 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.

2.2.9 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.

2.3 Unsuccessful call/connection set-up

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 value "resource unavailable – unspecified" is included, if no SIDs were available, cause value "No VPCI/VCI available" in case no VPCI/VCI is available, and cause value "user cell rate not available" in the case of lack of bandwidth. 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 value "resource unavailable – unspecified" is included, if no SIDs were available, or if the maximum end-to-end transit delay is exceeded, cause value "no VPCI/VCI available" in the case of lack of VPCI/VCI, and cause value "user cell rate not available" in the case of lack of bandwidth. 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 value 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 value 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 “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 set-up 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 value 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 set-up fails and an in-band tone or announcement has to be returned to the calling party from an exchange, or called party, the exchange, or user, concerned connects the in-band tone 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 value “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 value 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 value 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 value, no cause value 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 set-up. For unsuccessful call/connection set-ups 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 will not be included.

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 call/connection has been cleared.

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.

2.5 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 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 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".

d) *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 Recommendation Q.118), then the exchange where the timer has been started will initiate the release procedure on both sides. Cause value "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 set-up 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 set-up 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 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 “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 value “protocol error – unspecified”.

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

2.8 Primitive contents

Tables 2-2 to 2-14 list the mandatory and optional contents for the SACF Call Control service primitives for the set-up 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.)

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
AAL parameters	O	O
ATM cell rate	M	M
Broadband bearer capability	M	M
Broadband low layer information	O	–
Broadband high layer information	O	–
Called party number	M	M
Calling party's category	M	M
Connection element identifier	O	O
Echo control information	O	O
Forward narrow-band interworking indicator	–	O
Location number	O	O
Maximum end-to-end transit delay	O	O
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
Segmentation indicator	O (National use)	O (National use)
Transit network selection	O (National use)	O (National use)
Exchange type (Note 1)	M	M

NOTES

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.

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

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
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
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
AAL Parameters	O	O
Backward Narrow-band Interworking Indicator	–	O
Broadband Low Layer Information	O	–
Call History Information	O	O
Charge Indicator	O	O
In-Band Information Indicator	–	O
Narrow-band Bearer Capability	–	O
Narrow-band High Layer Capability	–	O
Narrow-band Low Layer Capability	–	O
OAM Traffic Descriptor	O	O
Progress Indicator	O	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	M
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
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

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 bandwith 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.

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.

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 is received for a virtual path connection which is not under the control of the B-ISDN User Part, it is discarded.

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 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 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[2)] 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 primitives.

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

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

When a Release 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 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 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 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.

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2) Communication is assumed between the Maintenance Application Process functions and the Call Control Application Process functions to achieve this.

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 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 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 set-up 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 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 cause values 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 cause values a diagnostic field is included containing, dependant on the cause value, 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

- 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. At a type A-exchange, the call/connection is released if the "Release Call indicator" is set to "Release Call".

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

NOTES

1 "x" = do not care.

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.

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

NOTES

1 "x" = do not care.

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.

3 In case of passing on a message, 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, Release indication or Release confirmation primitive. Any unrecognized parameters received in a Confusion 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 "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 "parameter non-existent or not implemented – discarded" followed by a diagnostic field containing the parameter name, or "message with unrecognized parameter discarded", followed by a diagnostic field containing the parameter name, or the message and parameter 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 the cause "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 "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 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 set-up protocol, as defined in this 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 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.
- 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 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 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).

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, 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 Recommendation Q.2763) and in the proper sequence (as specified in this 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 Table 2-1.

The parameters in these primitives are listed in Tables 2-2 to 2-14.

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 7-8.

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 8-12.

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:

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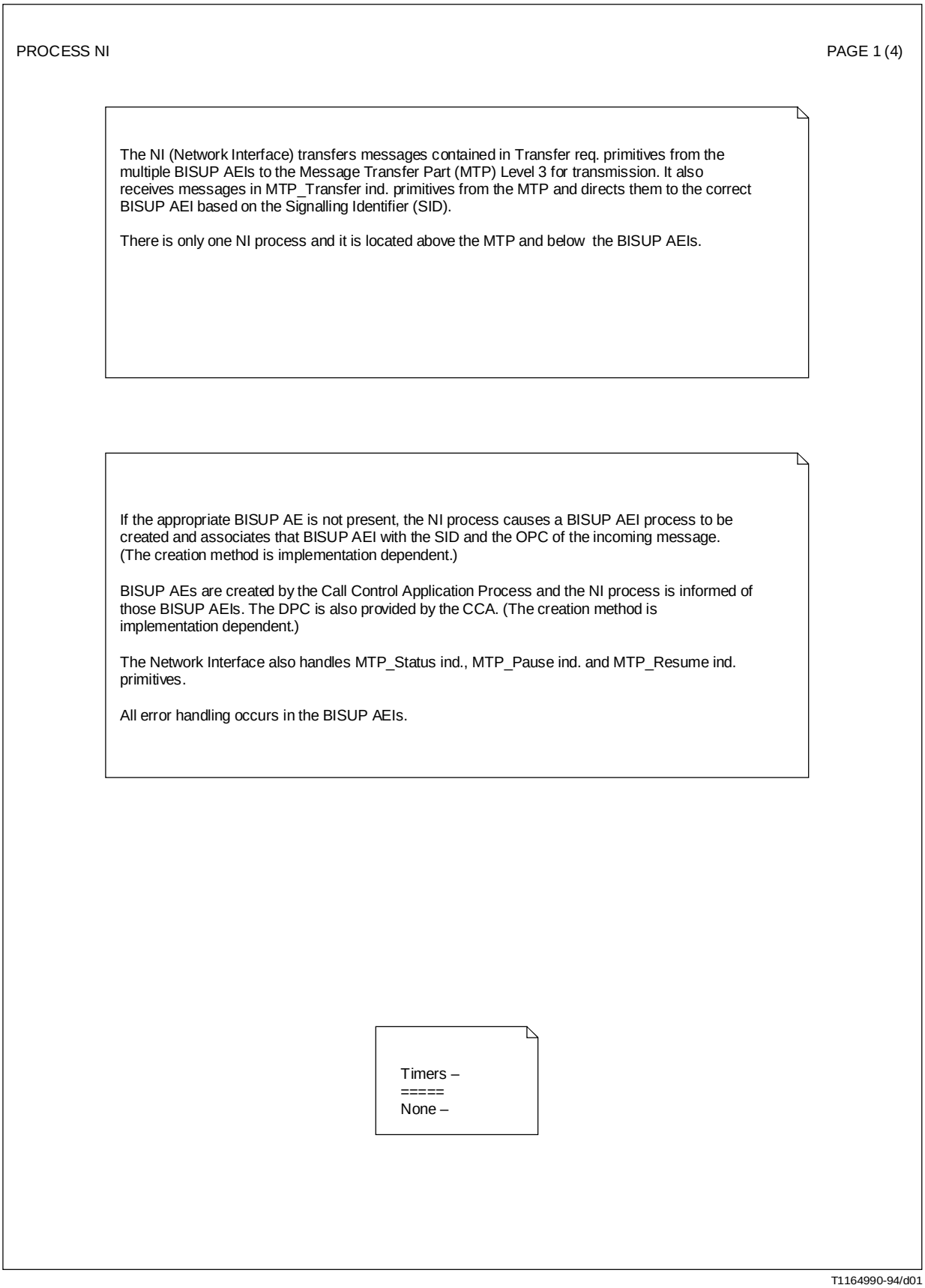

FIGURE 5-1/Q.2764 *(sheet 1 of 4)*

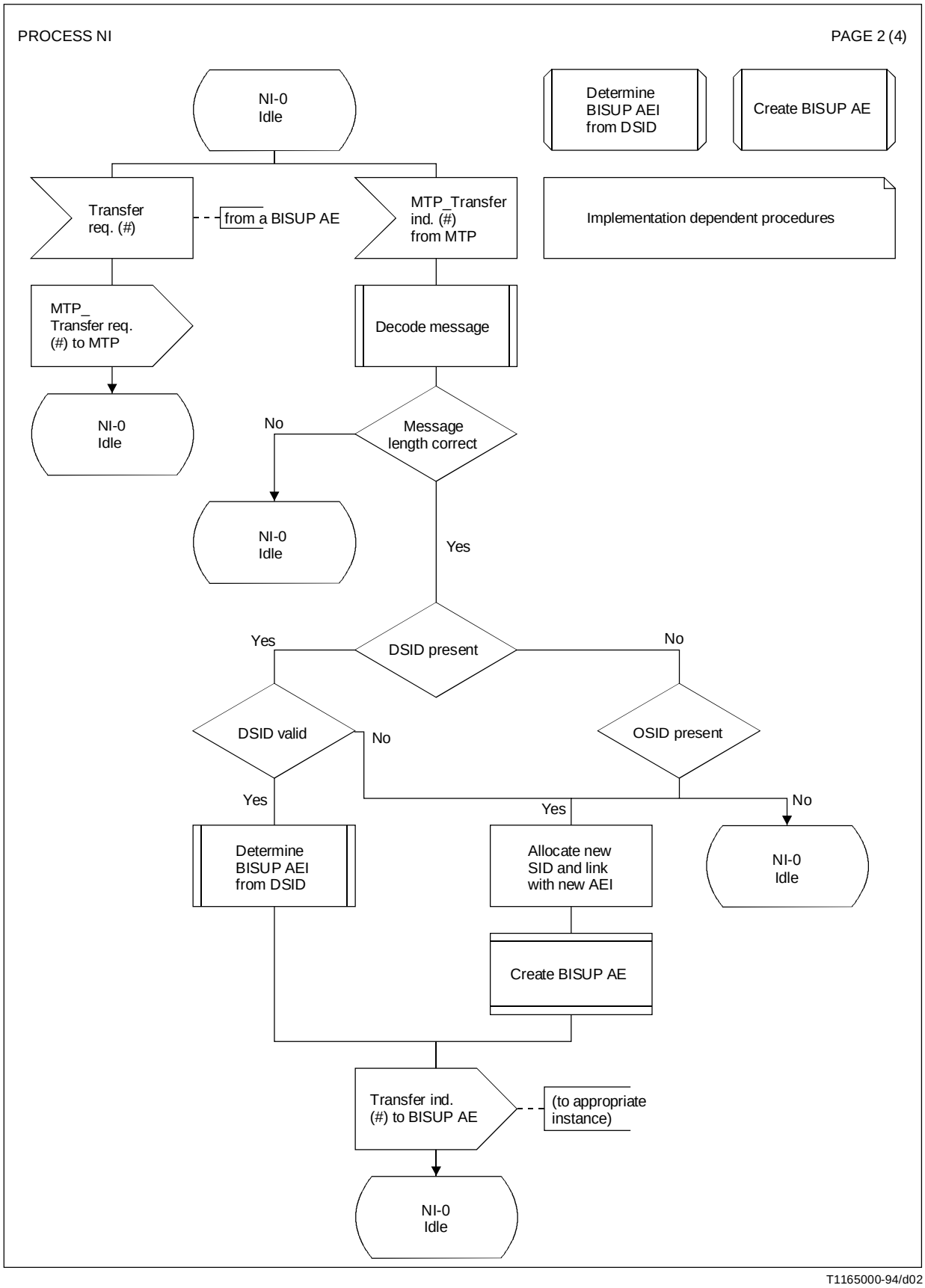

FIGURE 5-1/Q.2764 *(sheet 2 of 4)*

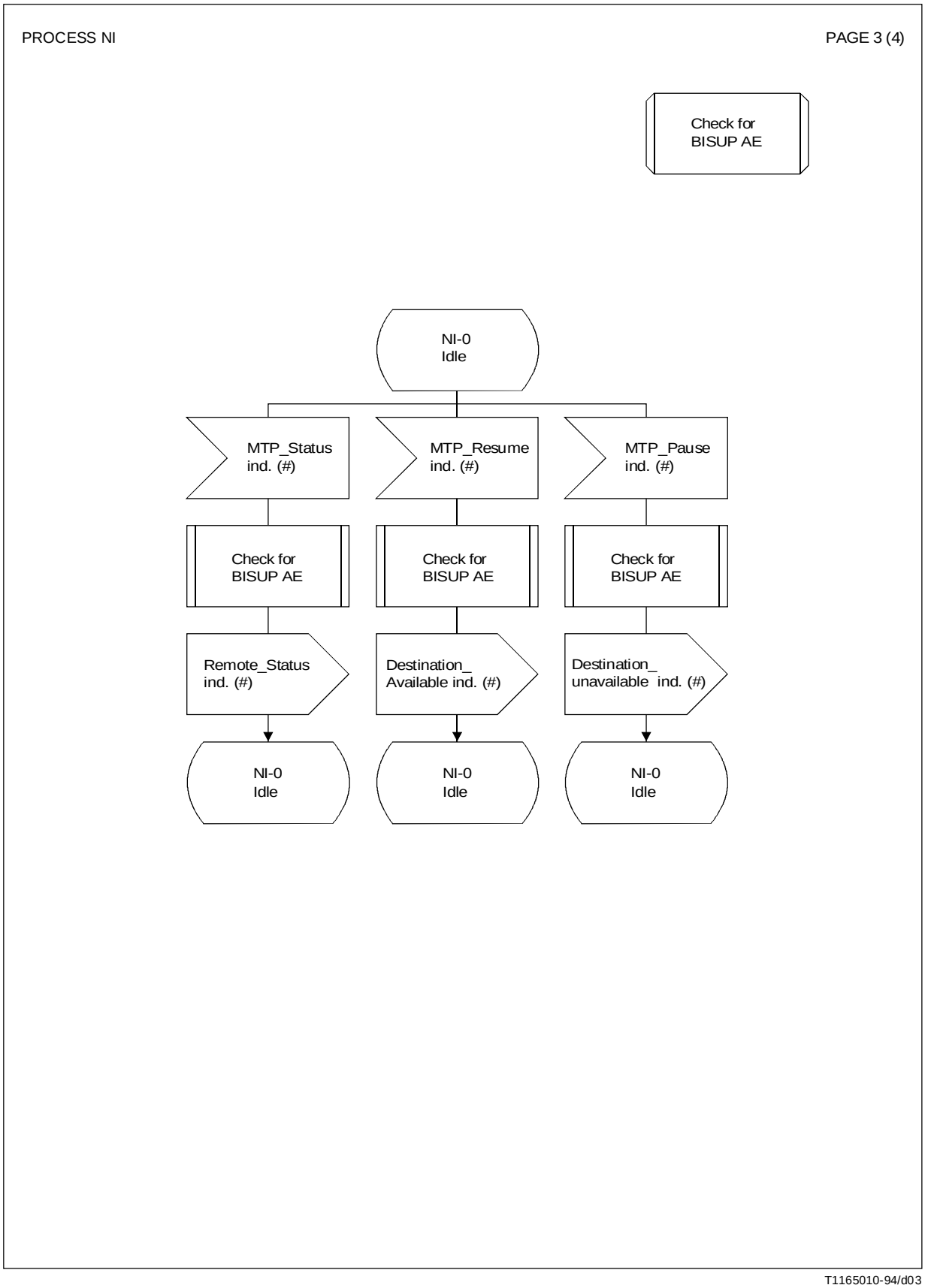

FIGURE 5-1/Q.2764 *(sheet 3 of 4)*

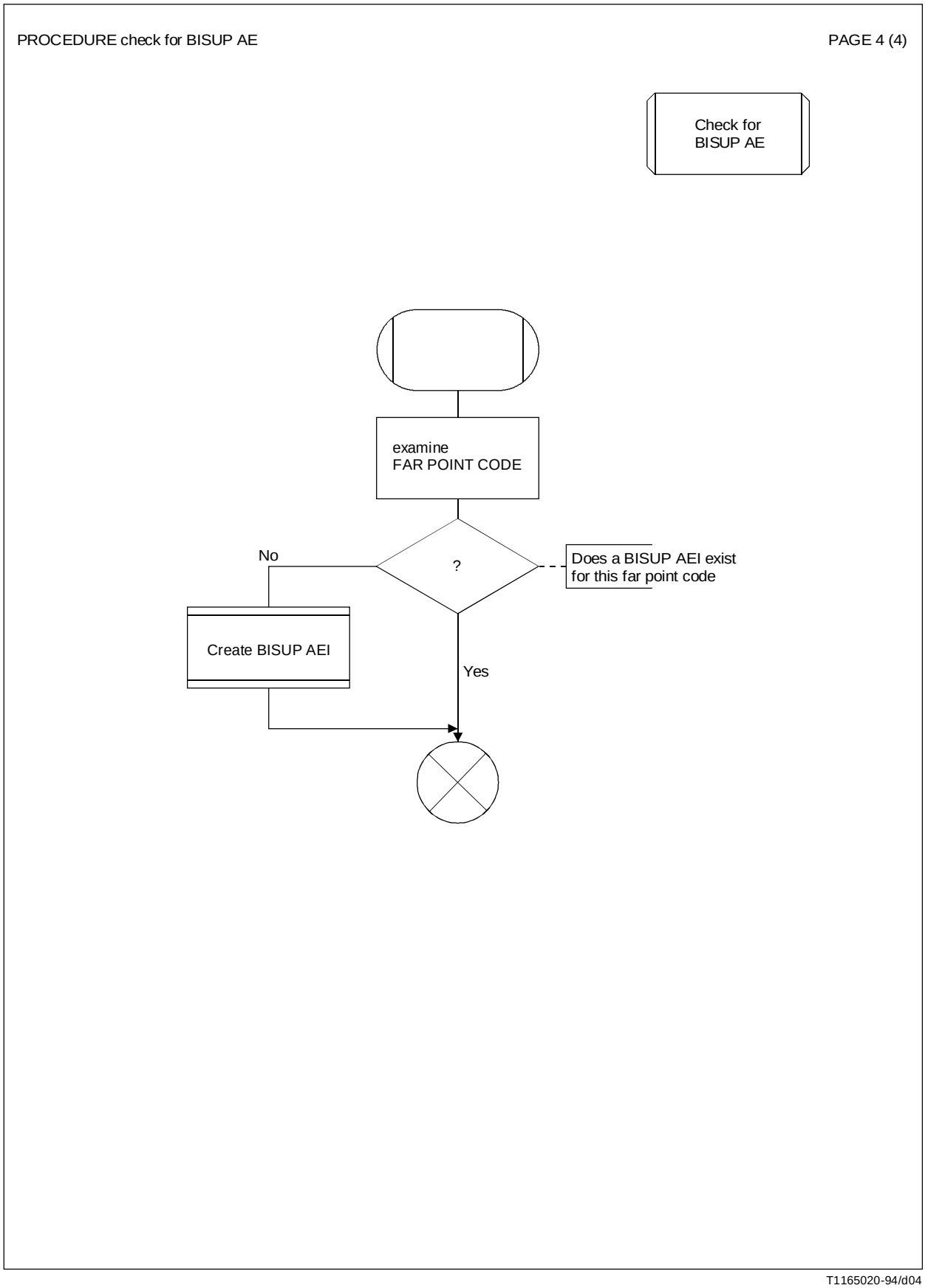

FIGURE 5-1/Q.2764 *(sheet 4 of 4)*

TABLE 6-1/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)
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_Test req./rsp.
Check_Resource_Begin req./rsp.			Check_Begin req./rsp.
Check_Resource_End req./rsp.			Check_End req./rsp.
	Interface f to UI ASE		
Unrecognized_Message_Type req.	Unrecognized_Message req.		
Confusion req.	Confusion req.		

NOTES

1 The Link_Information request is issued to BCC ASE if the Echo Control Information, AAL Parameters, Broadband Low Layer Information, Narrow-band Low Layer Compatibility, Narrow-band Bearer Capability, OAM Traffic Descriptor or Call History parameters are present.

2 The Congestion_Level request is issued to MC ASE if the Automatic Congestion Level parameter is present.

3 The Call_Suspend/Call_Resume request primitives are issued to CC ASE if the Suspend/resume indicators parameter indicates “network initiated”.

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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 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*

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
–	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
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

NOTES

1 All the above messages include Signalling ID parameter(s), for a description of the use of these parameters see 6.4.

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.

3 Optional primitive, see Table 6-1.

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b) *Maintenance primitives*

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

NOTES

1 All the above messages include Signalling ID parameter(s), for a description of the use of these parameters see 6.4.

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.

Superseded by a more recent version

c) *Unrecognized information primitives*

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 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.

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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 7-8 (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 and CC 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)
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

NOTES

1 Primitive issued to BCC ASE if the Echo Control Information, AAL Parameters, Broadband Low Layer Information, Narrow-band Low Layer Compatibility, Narrow-band Bearer Capability, OAM Traffic Descriptor or Call History parameters are present.

2 Primitive issued if the Automatic Congestion Level parameter is present.

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.
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.

NOTES

1 The primitive sent to the AP can also contain unrecognized parameters handled by UI ASE. (Unrecognized_Parameter indication issued by UI ASE.)

2 "–" means not applicable primitive.

"*" means "do not care", i.e. any primitive, or no primitive[3)].

3 Optional primitive, see Table 6-5.

3) Either ASE can, independently, issue its Error indication on detecting an unexpected message. Such an indication overrides the actions of the other ASE.

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_Test 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.

6.5 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).

Superseded by a more recent version

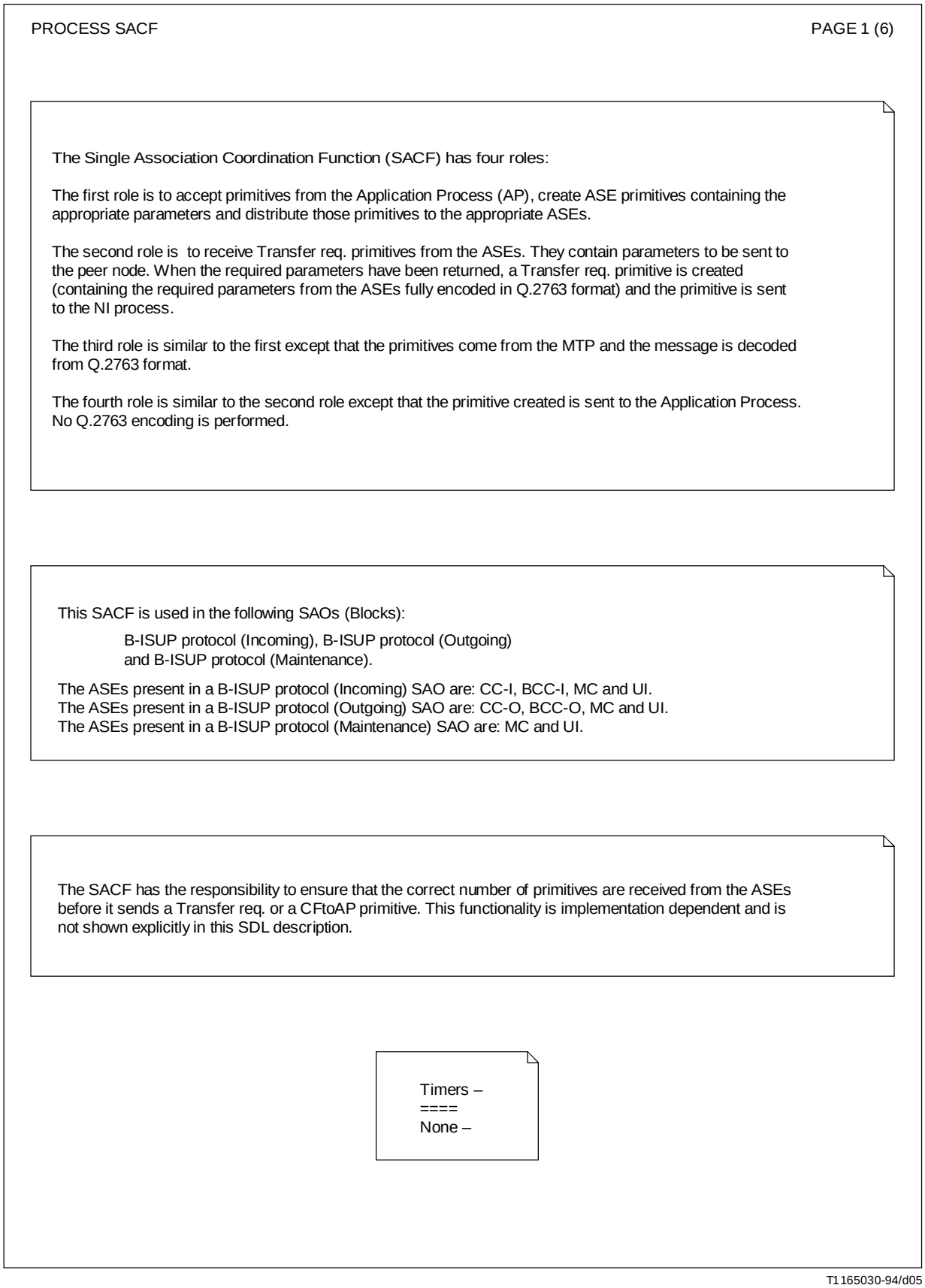

FIGURE 6-1/Q.2764 *(sheet 1 of 6)*

Superseded by a more recent version

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.

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FIGURE 6-1/Q.2764 *(sheet 2 of 6)*

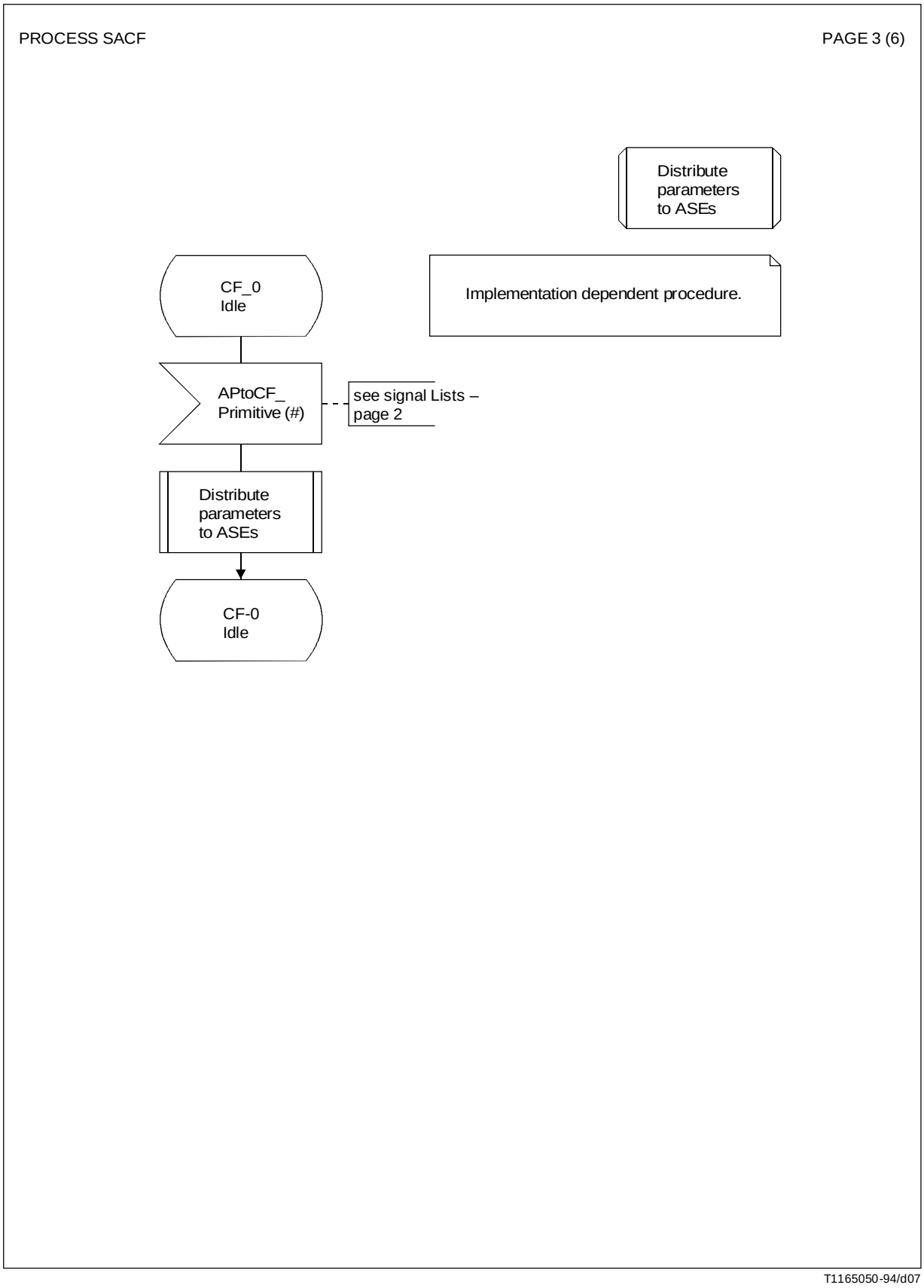


FIGURE 6-1/Q.2764 *(sheet 3 of 6)*

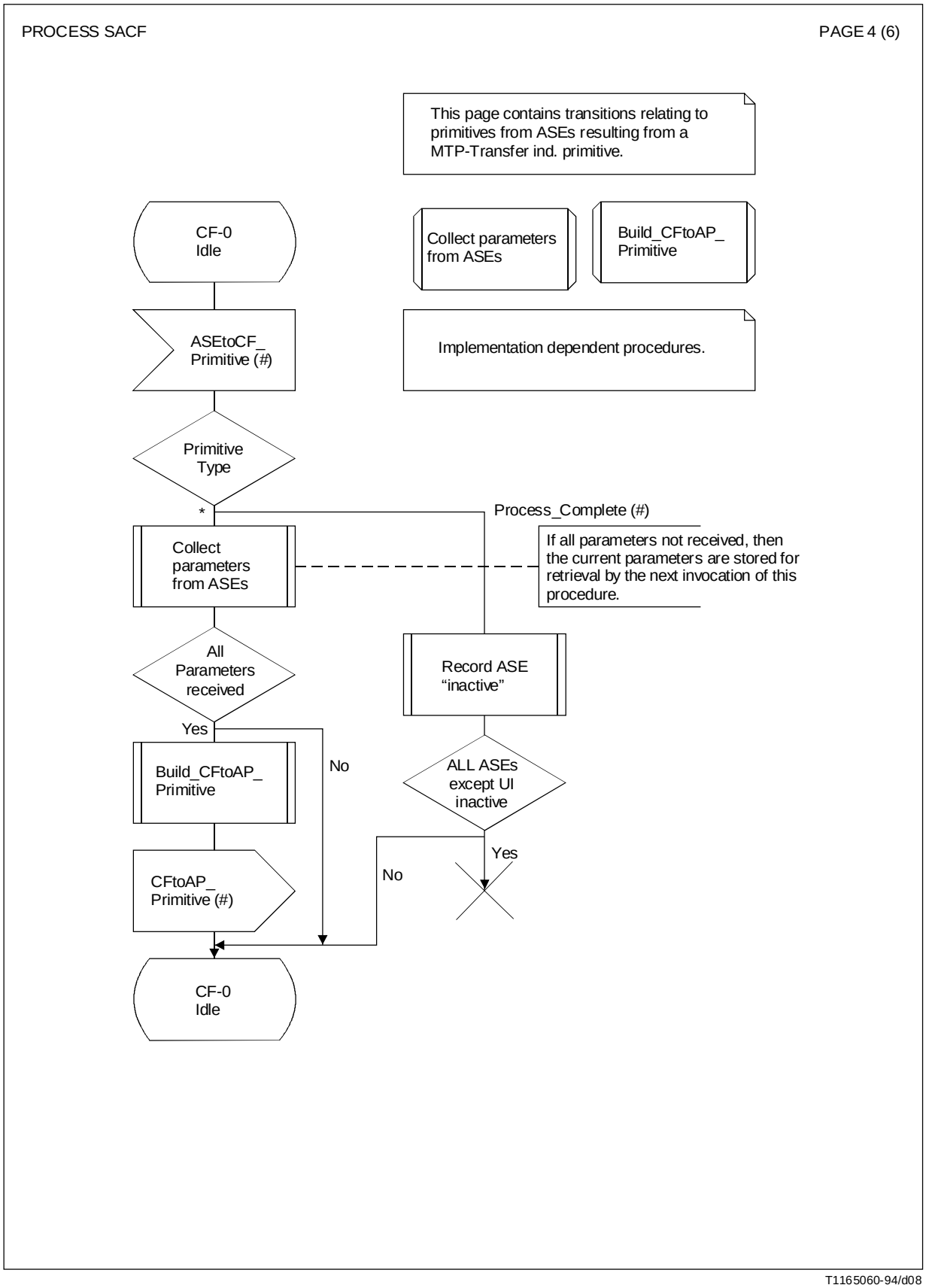


FIGURE 6-1/Q.2764 *(sheet 4 of 6)*

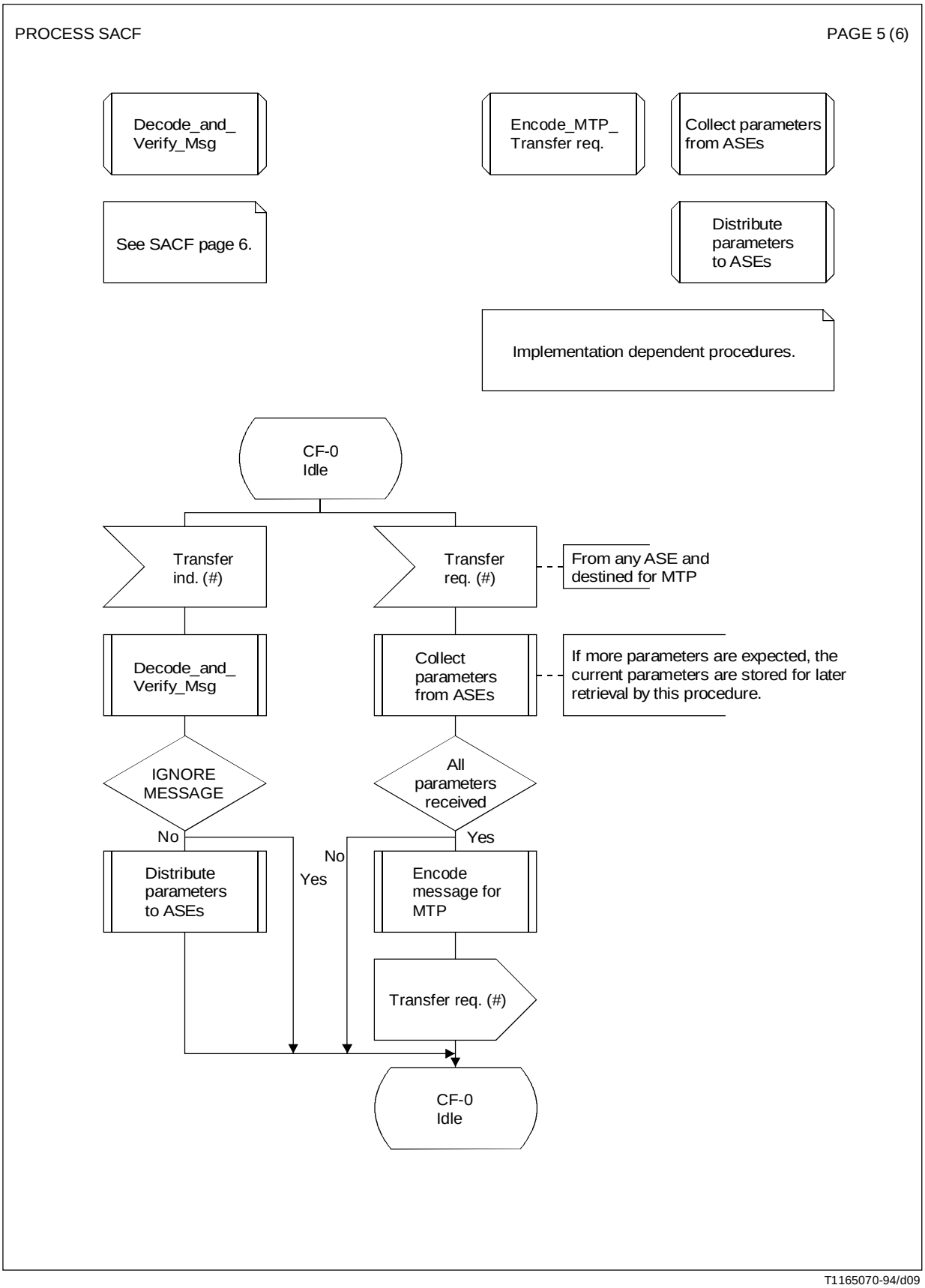


FIGURE 6-1/Q.2764 *(sheet 5 of 6)*

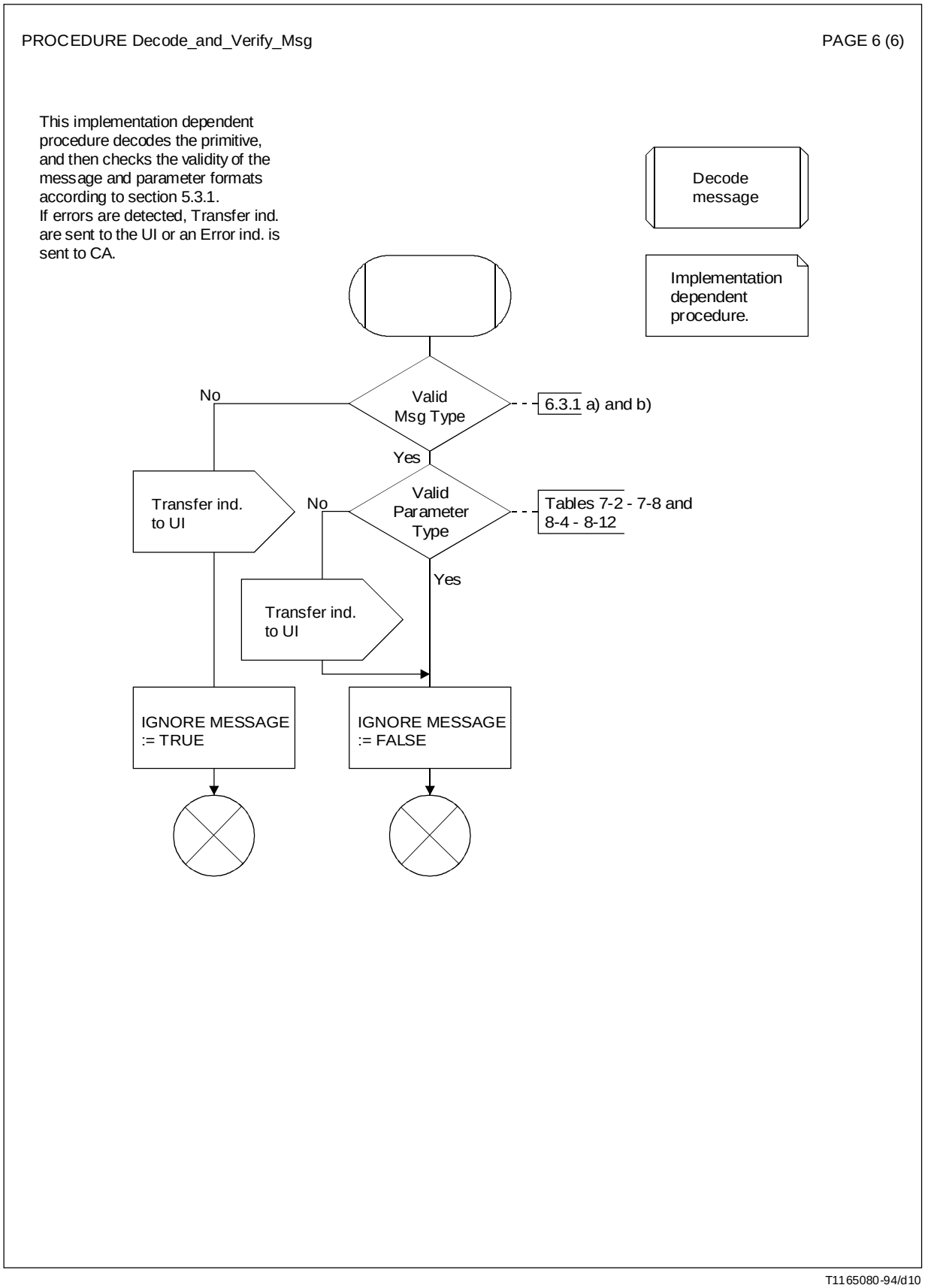


FIGURE 6-1/Q.2764 *(sheet 6 of 6)*

7 Bearer Connection Control ASE (BCC ASE)

This clause specifies all the protocol procedures that relate to the set-up and cleardown of connections between adjacent exchanges.

BCC ASE procedures are not dependent on the exchange types (as listed in subclause 1.1).

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

Tables 7-2 to 7-8 (see 7.4) list the contents for these primitives for the set-up 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 set-up

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 set-up 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 value "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.

7.3 Incoming BCC ASE

7.3.1 Bearer connection set-up

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 set-up 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.

7.4 Primitive contents

Tables 7-2 to 7-8 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
AAL Parameters
ATM Cell Rate
Broadband Low Layer Information
Broadband Bearer Capability
Connection Element Identifier
Echo Control Information
Maximum End-to-End Transit Delay
Narrow-band Bearer Capability
Narrow-band Low Layer Compatibility
OAM Traffic Descriptor
Propagation Delay Counter

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
AAL Parameters
Echo Control Information
Broadband Low layer Information
Call History Information
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

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.)

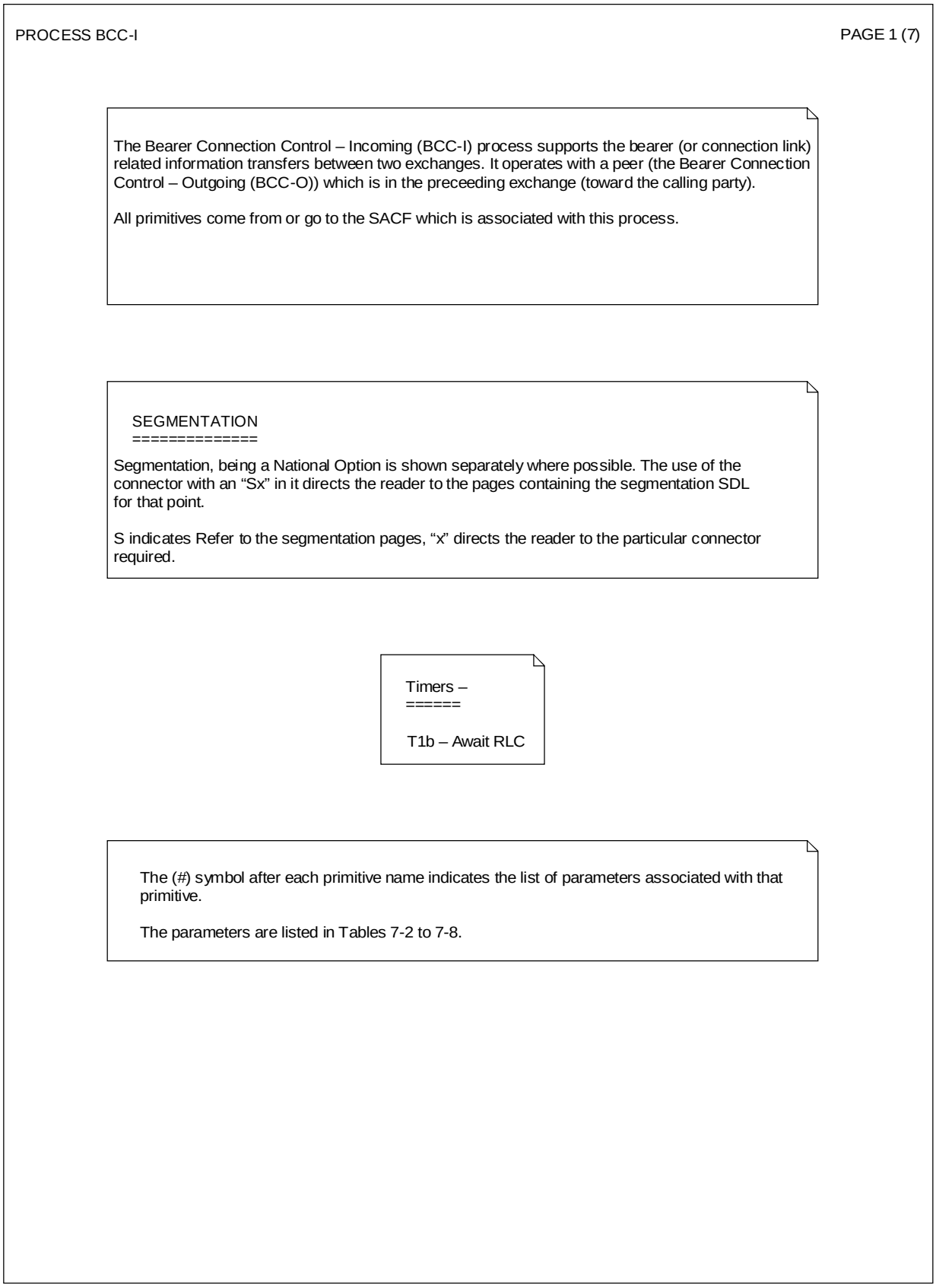


FIGURE 7-1/Q.2764 *(sheet 1 of 7)*

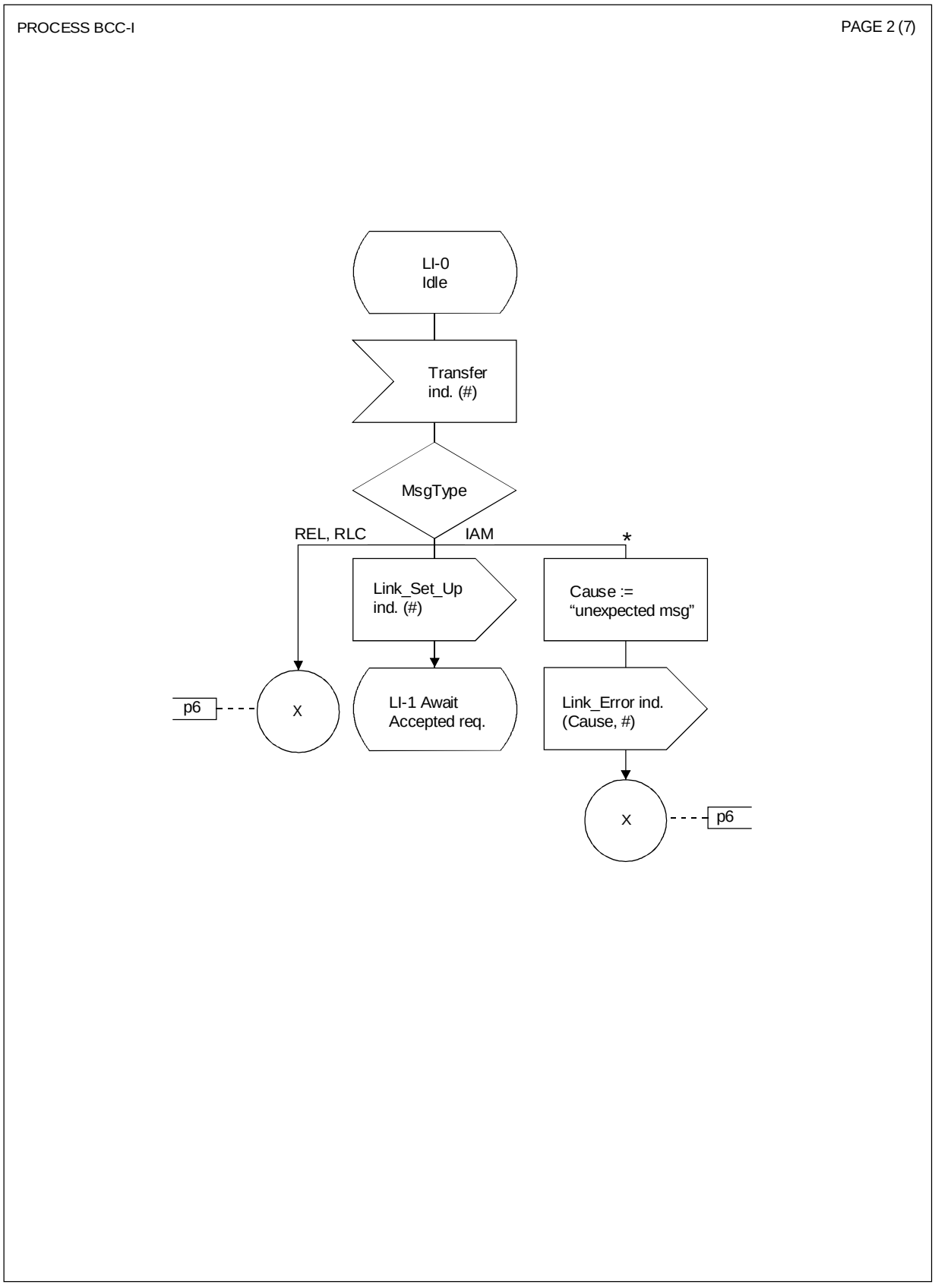


FIGURE 7-1/Q.2764 *(sheet 2 of 7)*

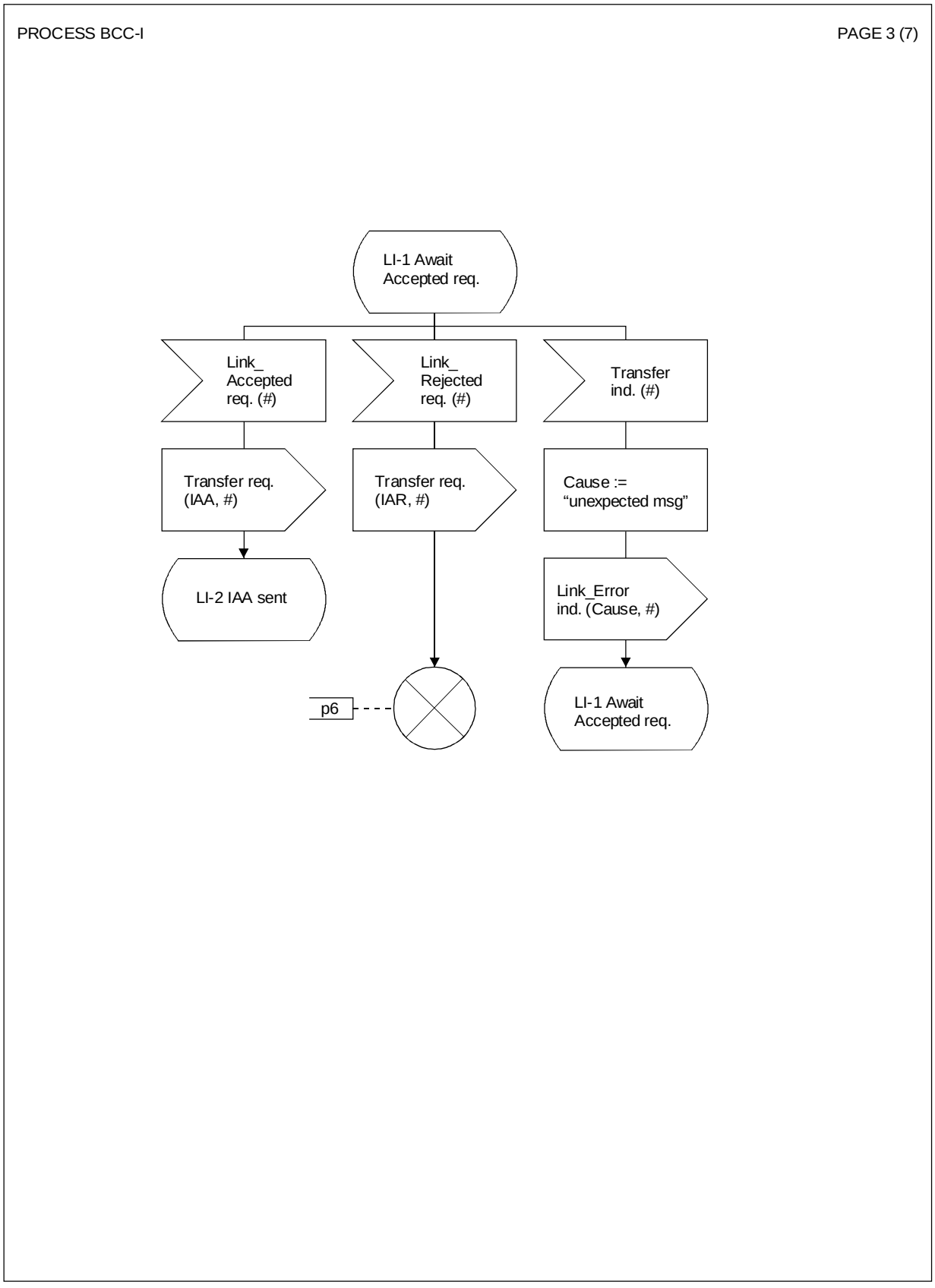


FIGURE 7-1/Q.2764 *(sheet 3 of 7)*

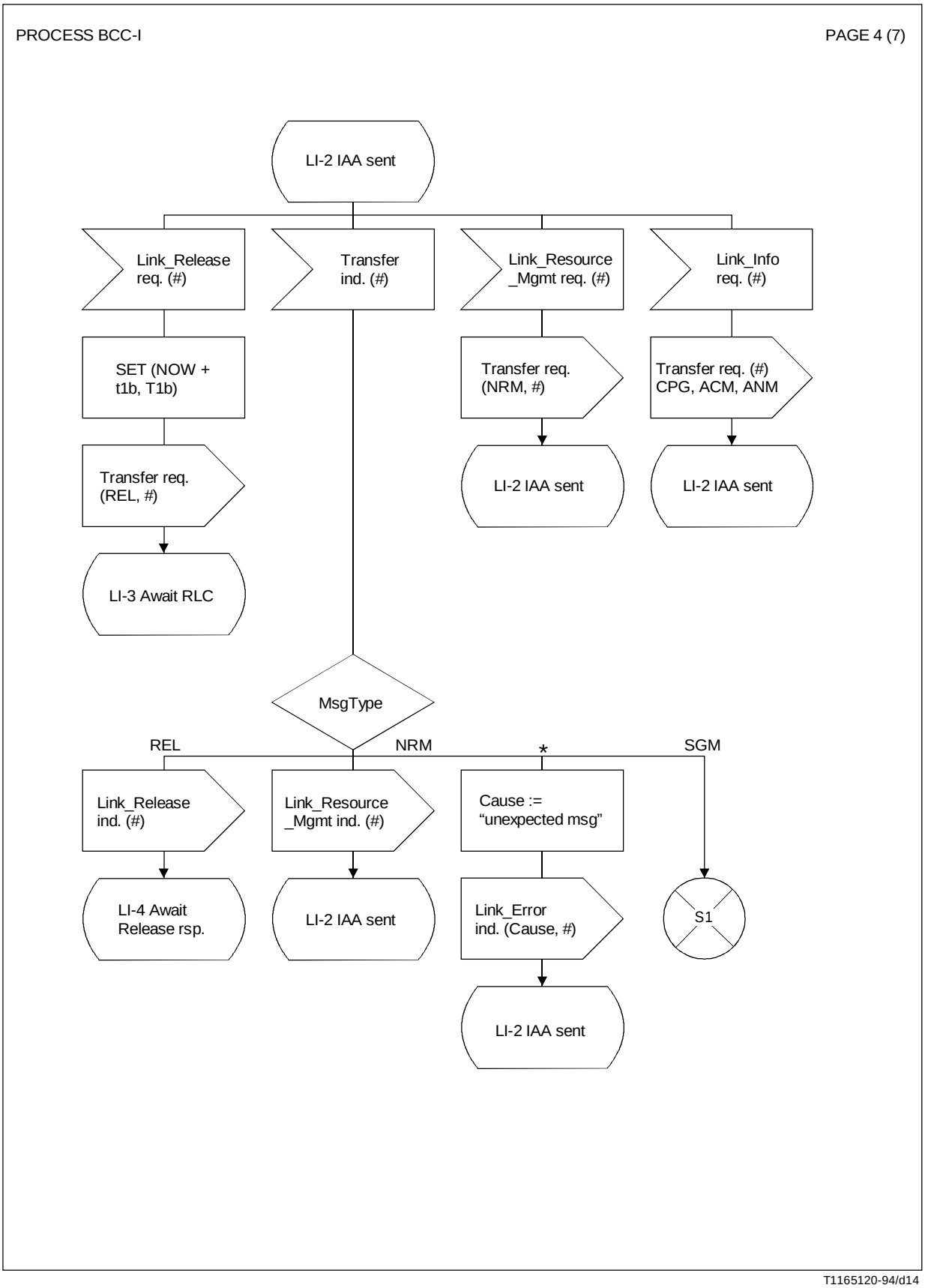


FIGURE 7-1/Q.2764 *(sheet 4 of 7)*

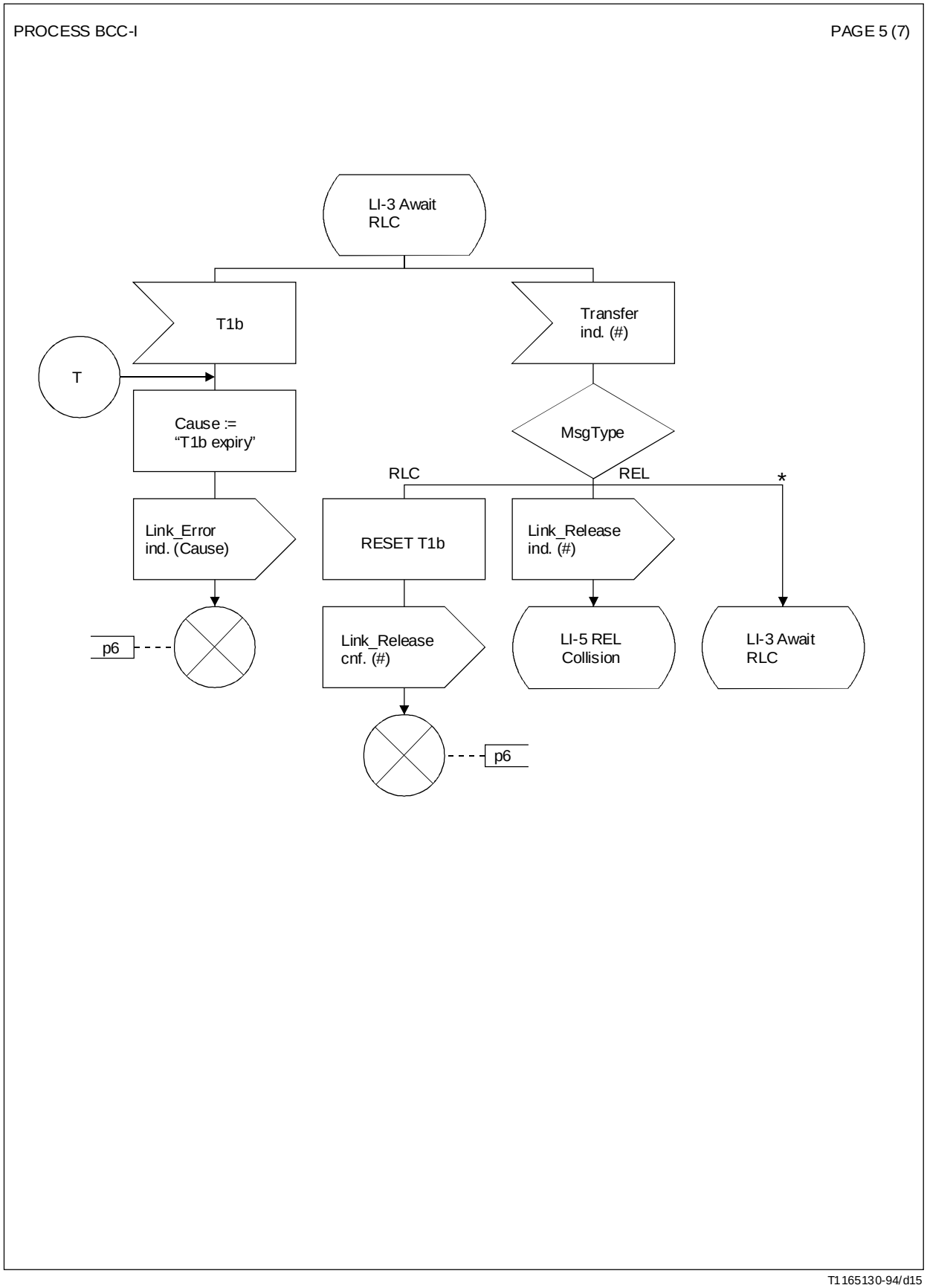


FIGURE 7-1/Q.2764 *(sheet 5 of 7)*

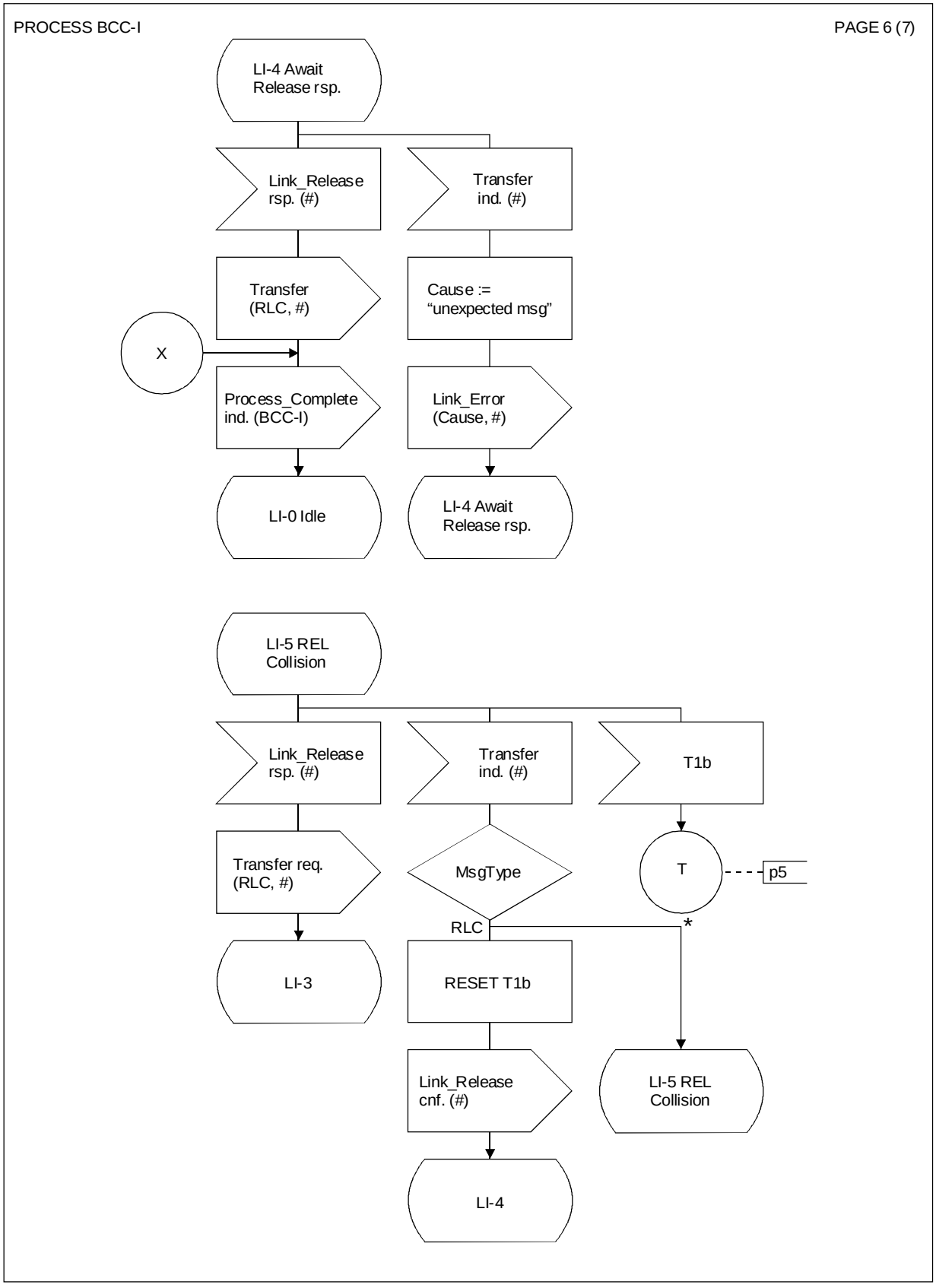


FIGURE 7-1/Q.2764 *(sheet 6 of 7)*

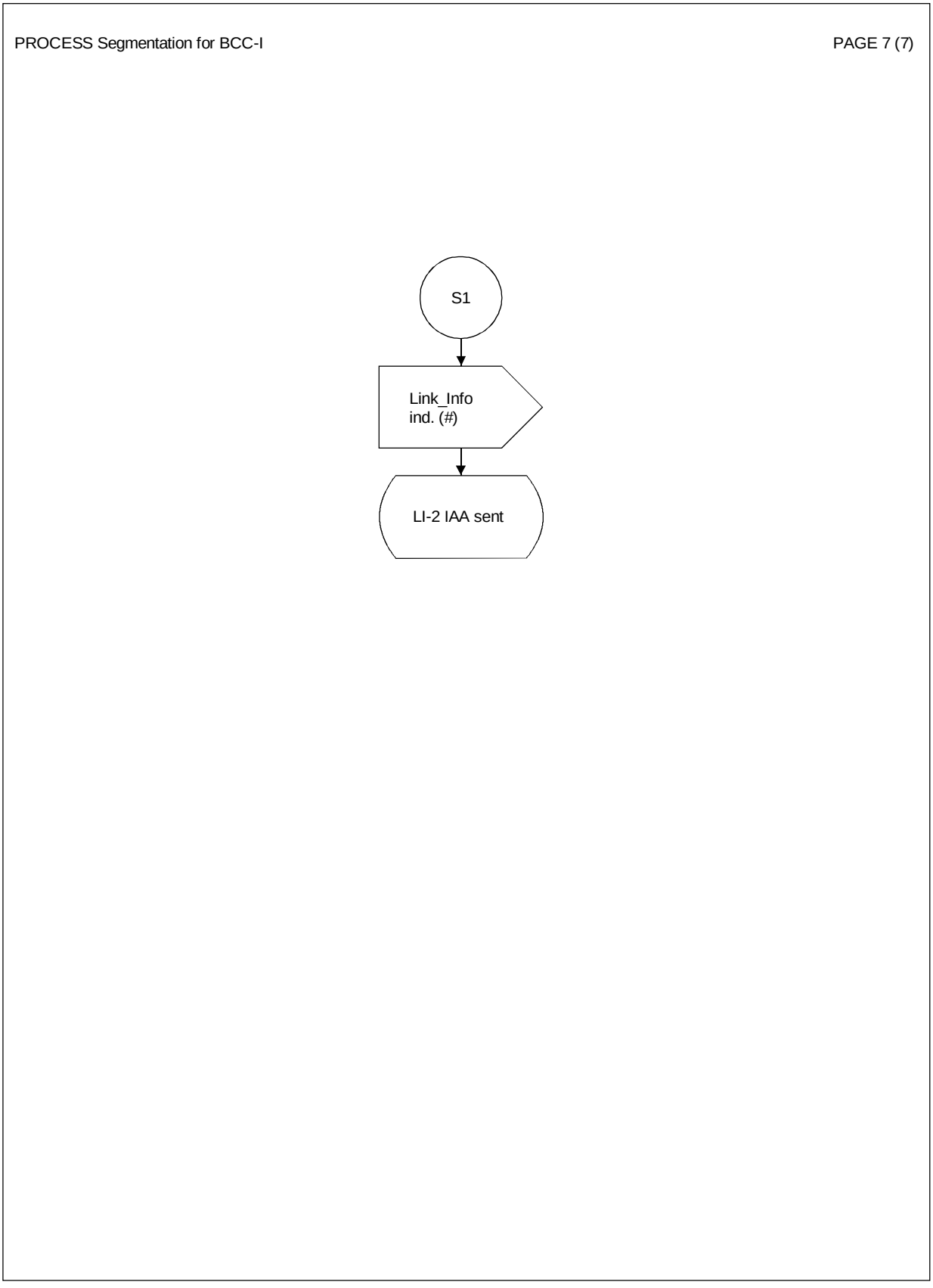


FIGURE 7-1/Q.2764 *(sheet 7 of 7)*

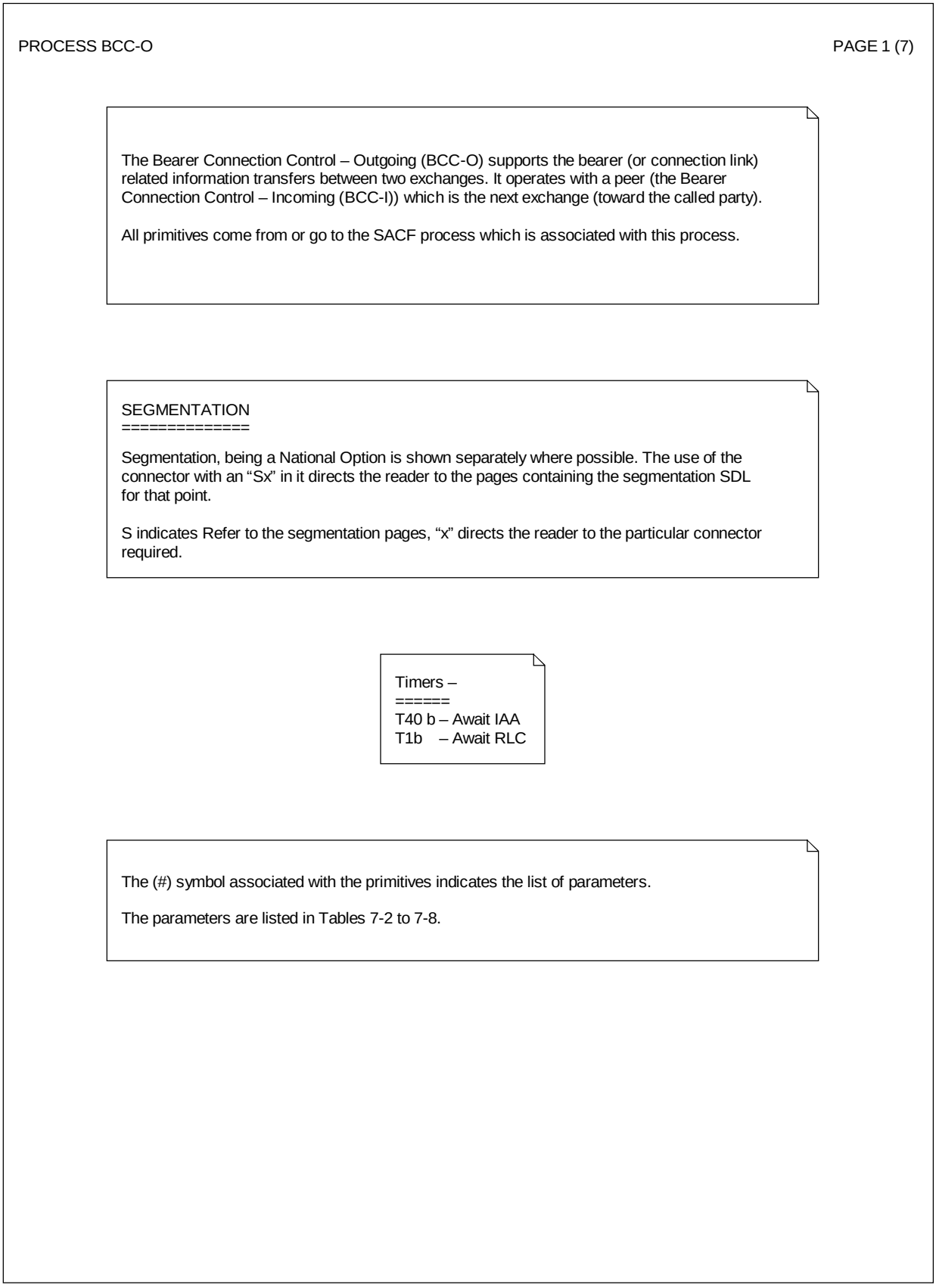


FIGURE 7-2/Q.2764 *(sheet 1 of 7)*

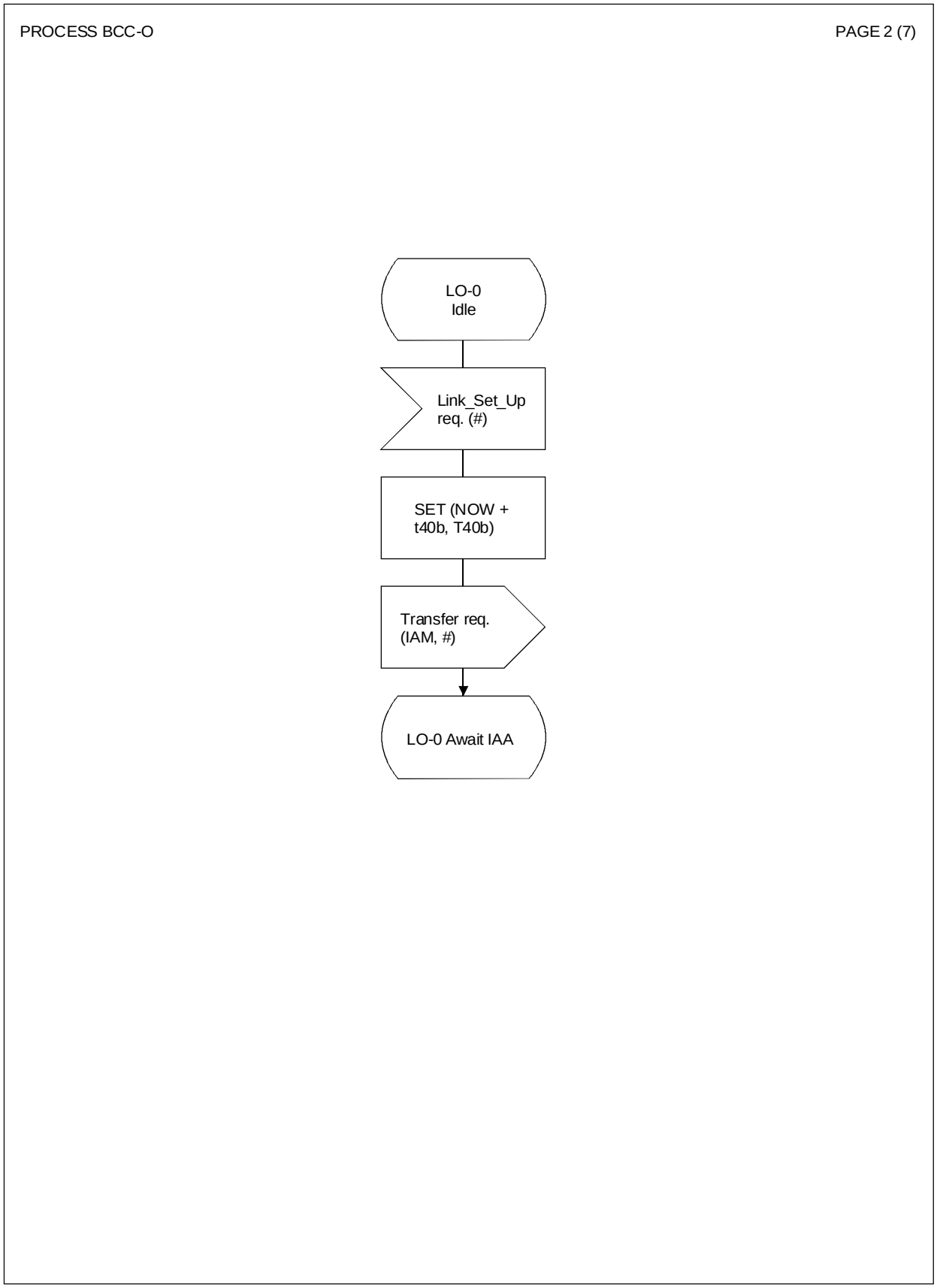


FIGURE 7-2/Q.2764 *(sheet 2 of 7)*

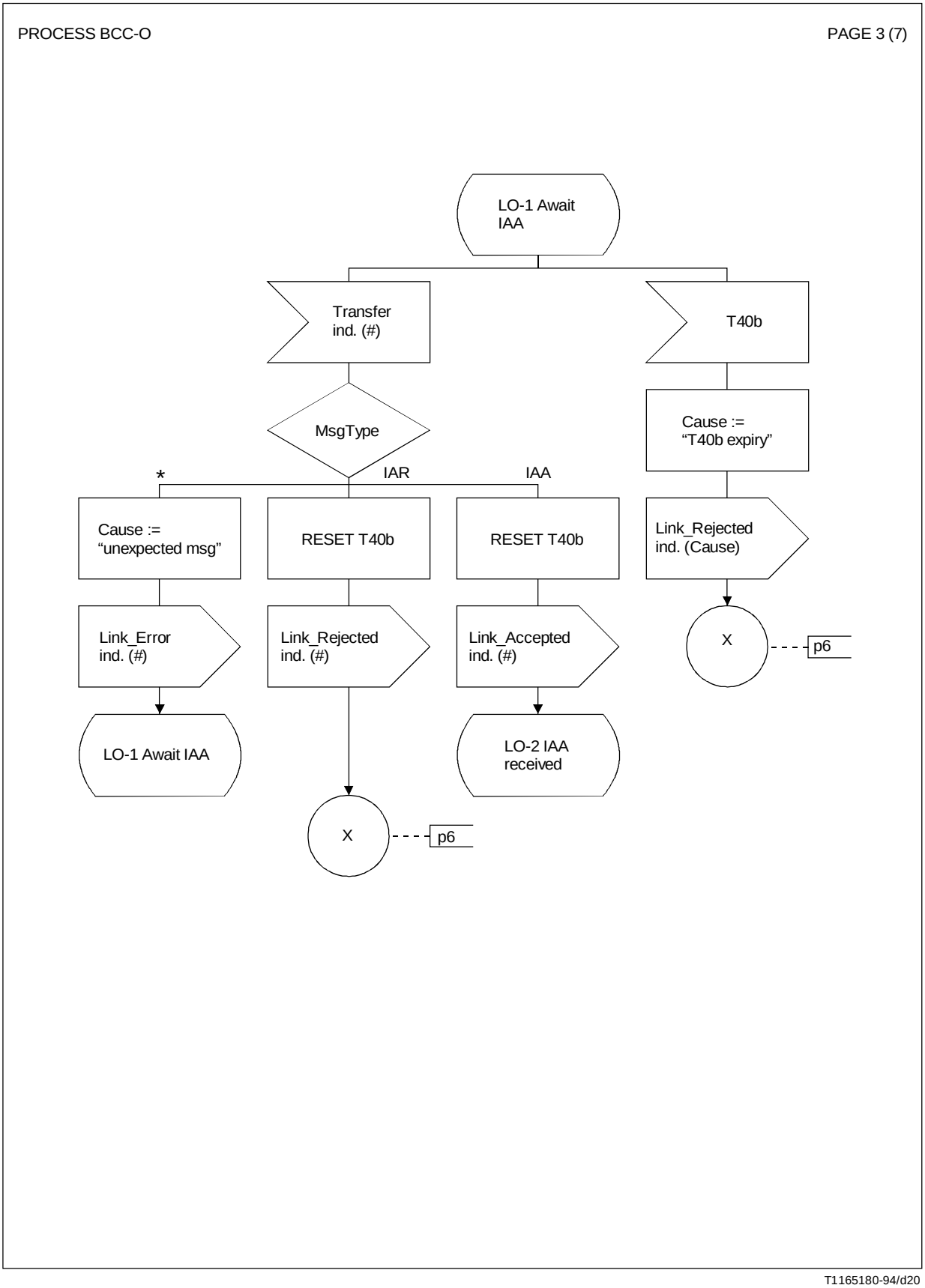


FIGURE 7-2/Q.2764 *(sheet 3 of 7)*

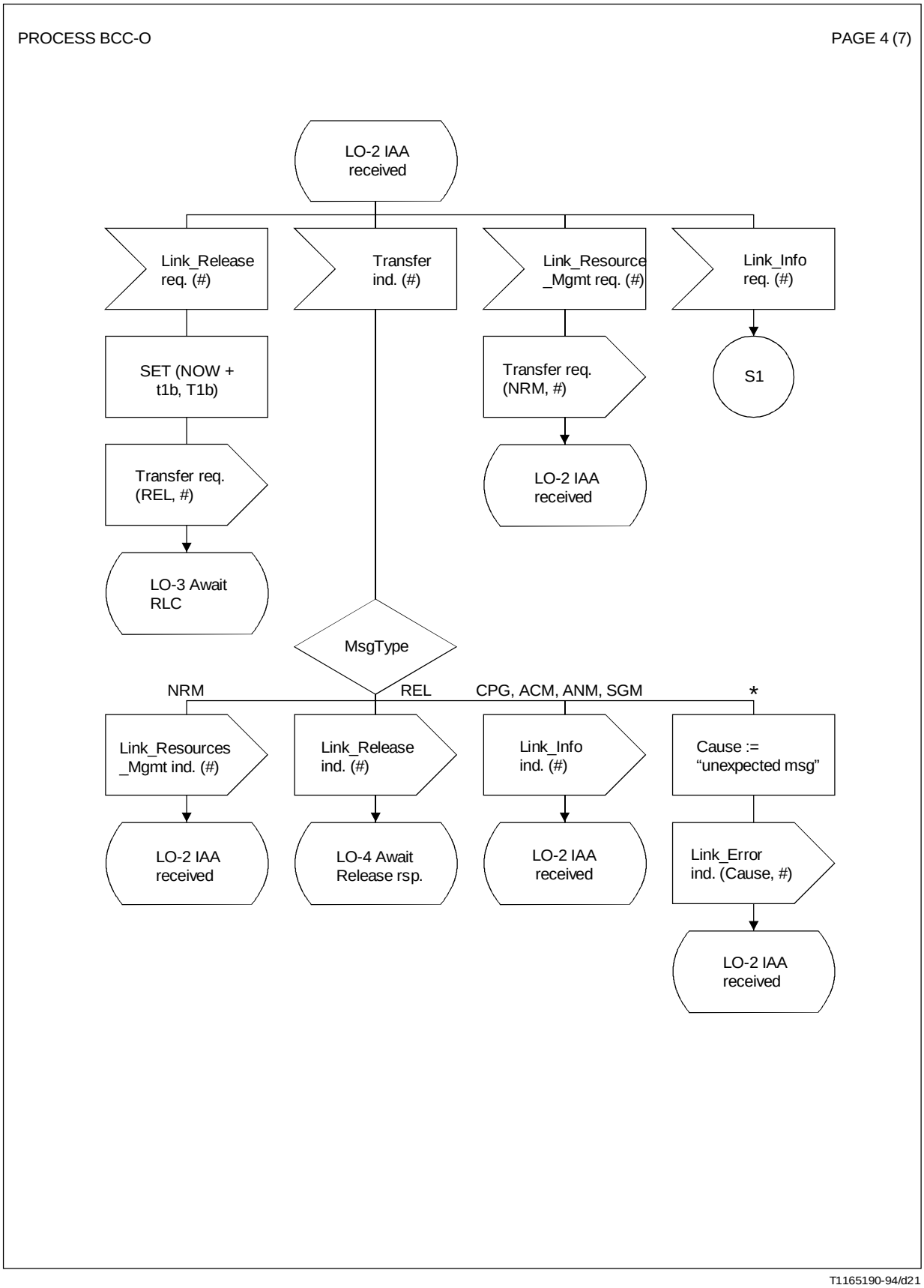


FIGURE 7-2/Q.2764 *(sheet 4 of 7)*

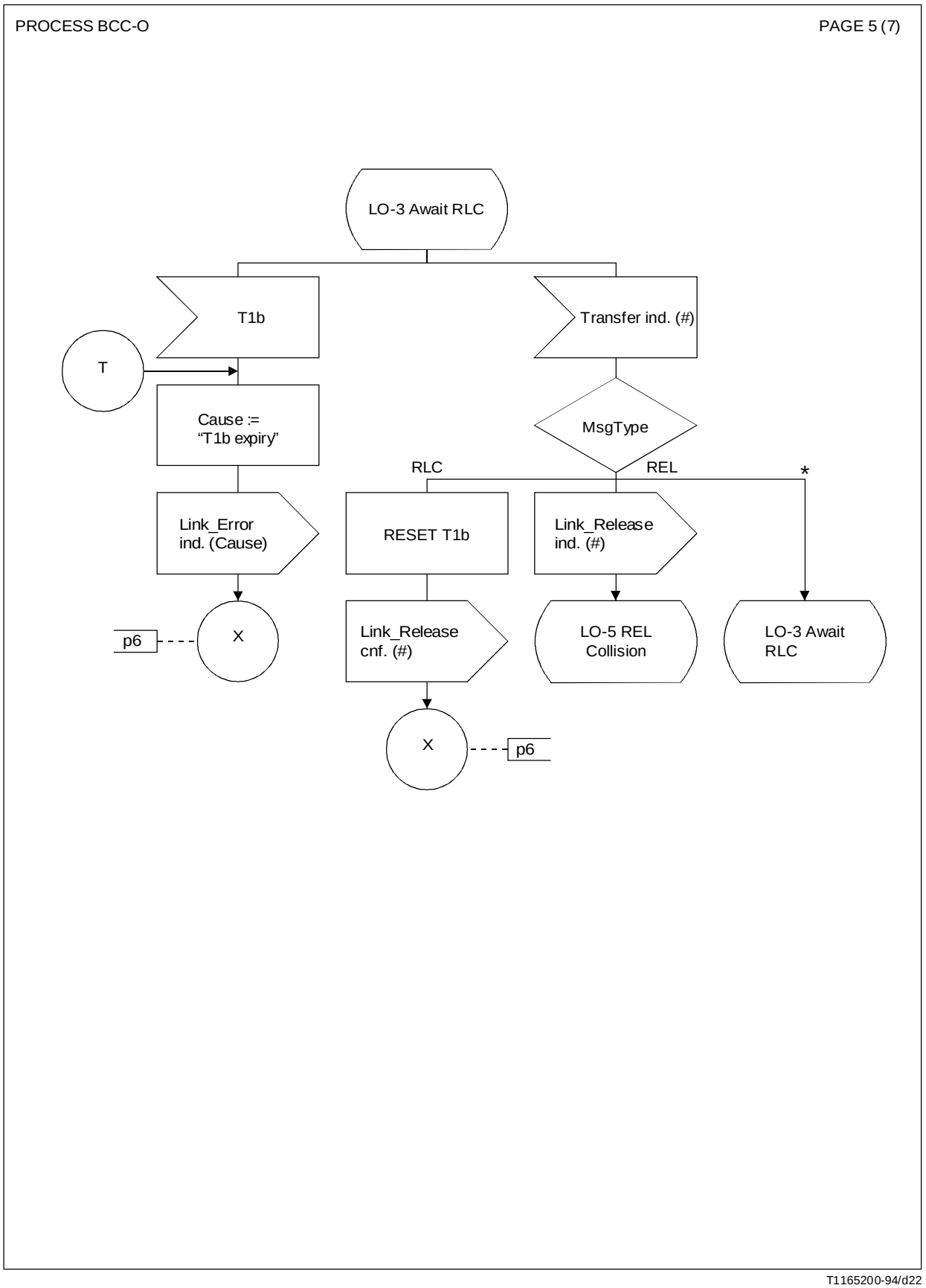


FIGURE 7-2/Q.2764 *(sheet 5 of 7)*

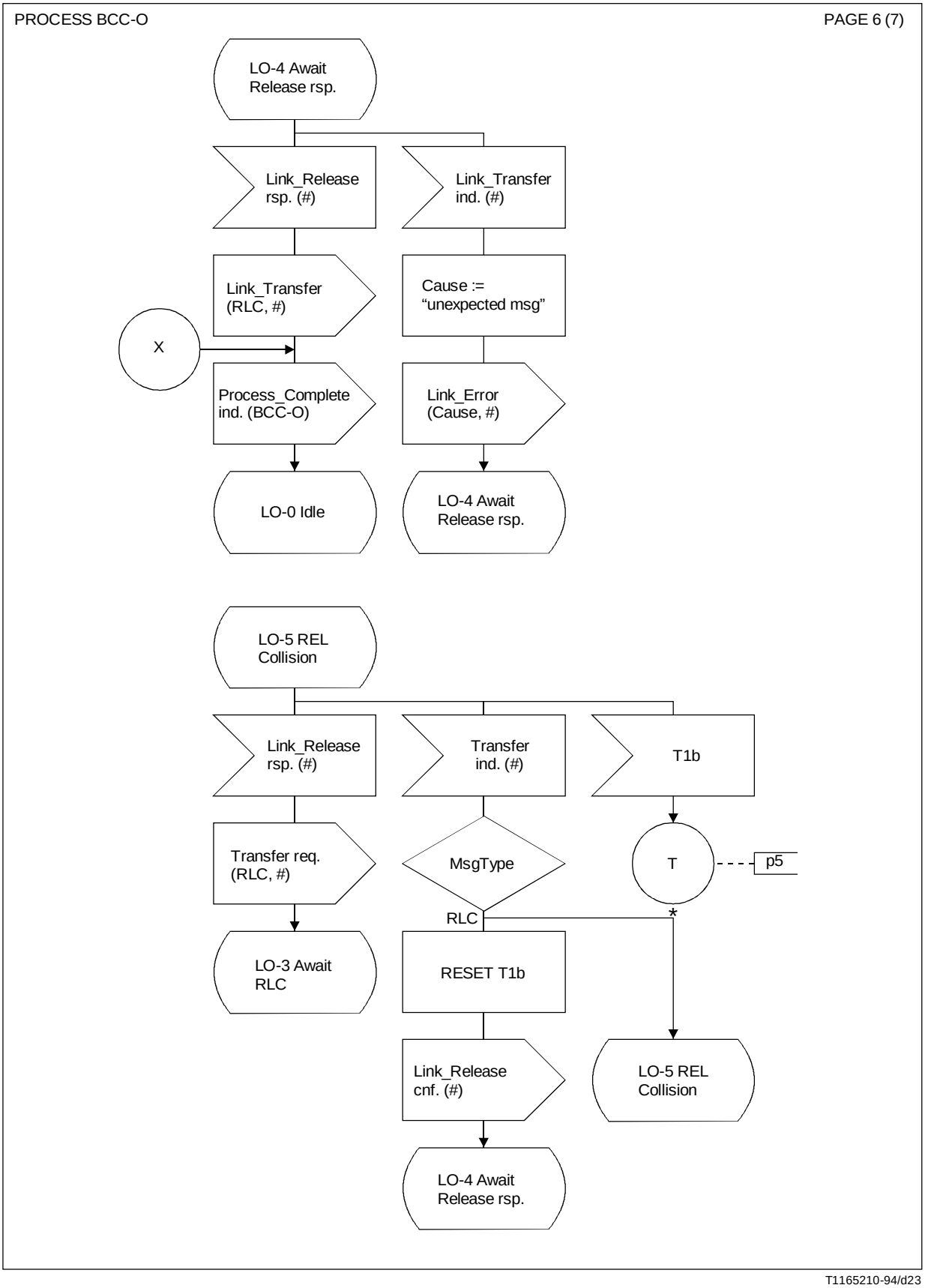


FIGURE 7-2/Q.2764 *(sheet 6 of 7)*

Superseded by a more recent version

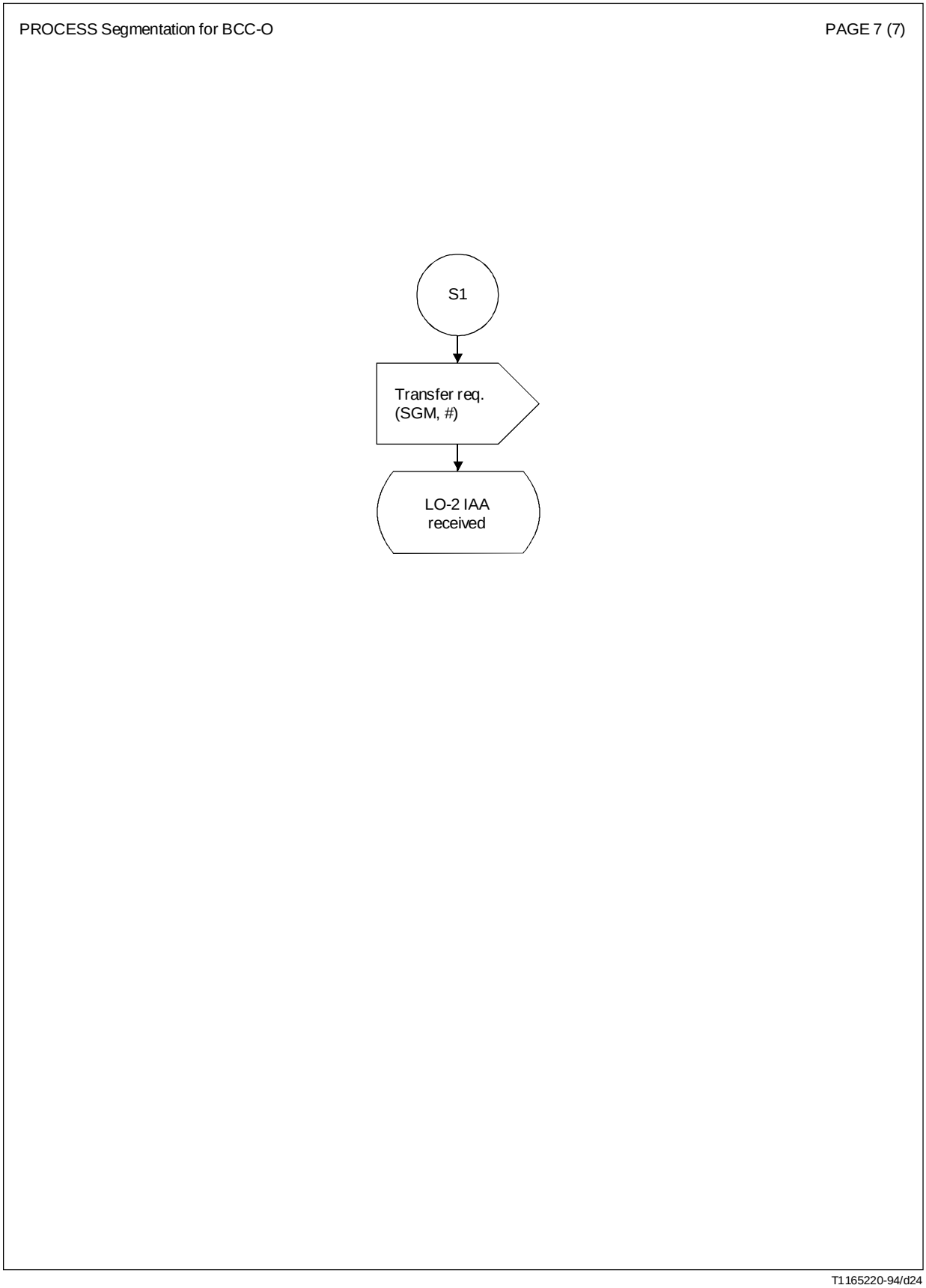


FIGURE 7-2/Q.2764 *(sheet 7 of 7)*

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_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

Tables 8-3 to 8-12 (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 8.4 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.

Superseded by a more recent version

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 re-started 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_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

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 8.4 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_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

8.4 Primitive contents

Tables 8-4 to 8-12 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
Broadband High Layer Information
Called Party Number
Calling Party's Category
Forward Narrow-band Interworking Indicator
Location Number
Narrow-band High Layer Compatibility
National/international Call Indicator
Origination ISC Point Code
Progress Indicator
Segmentation Indicator
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
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
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
Narrow-band High Layer Capability
Progress Indicator
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
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

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.)

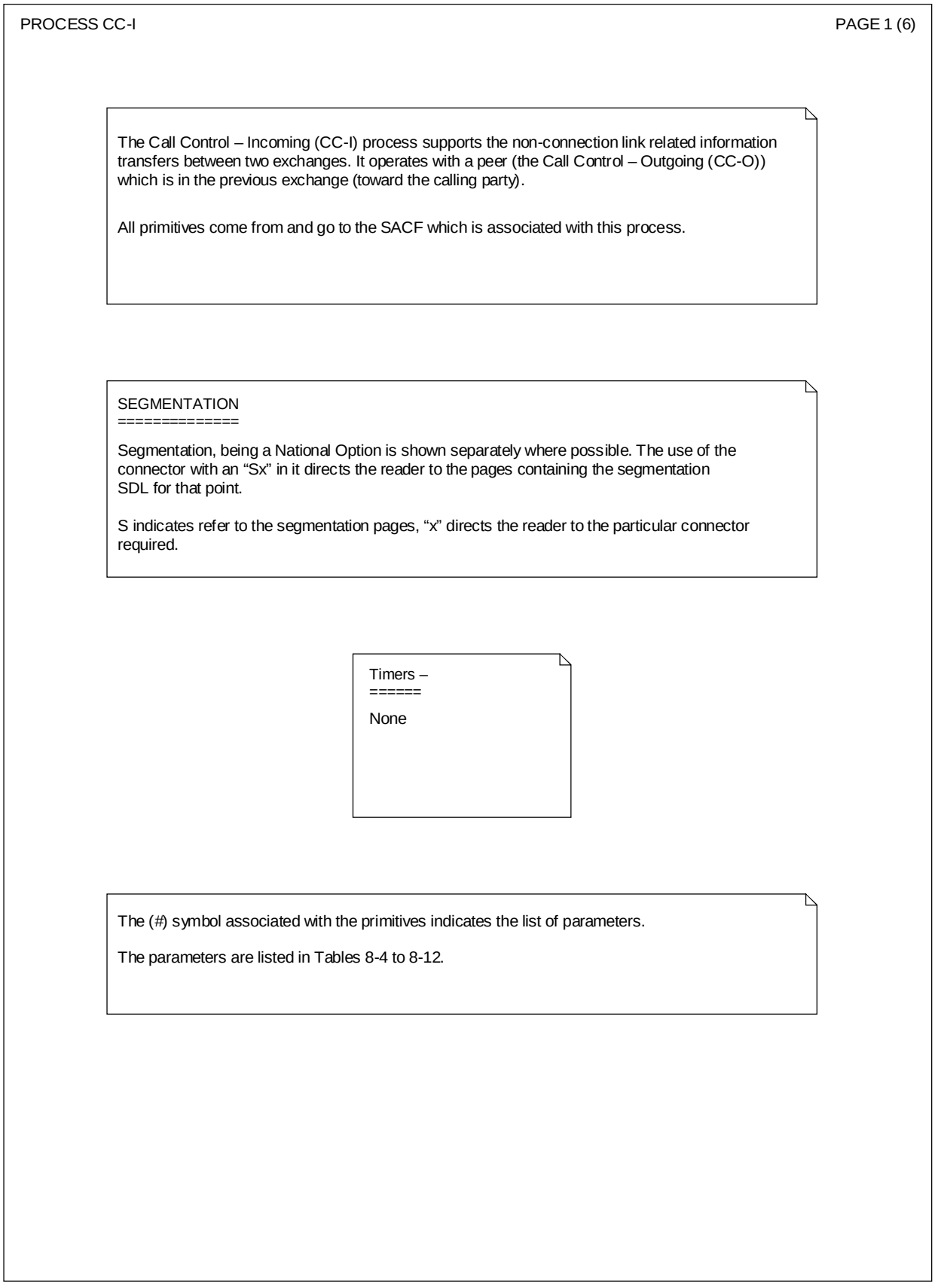


FIGURE 8-1/Q.2764 *(sheet 1 of 6)*

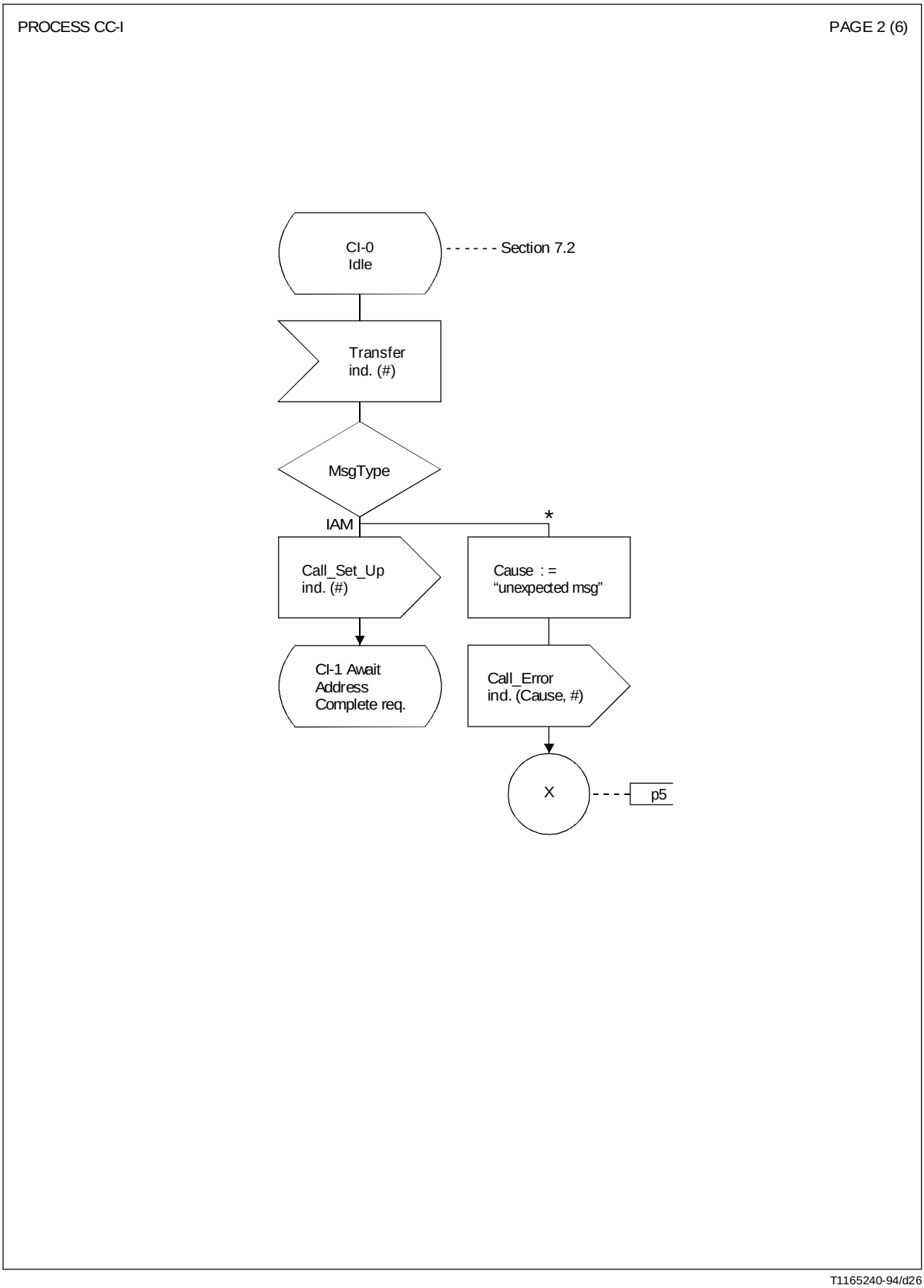


FIGURE 8-1/Q.2764 *(sheet 2 of 6)*

Superseded by a more recent version

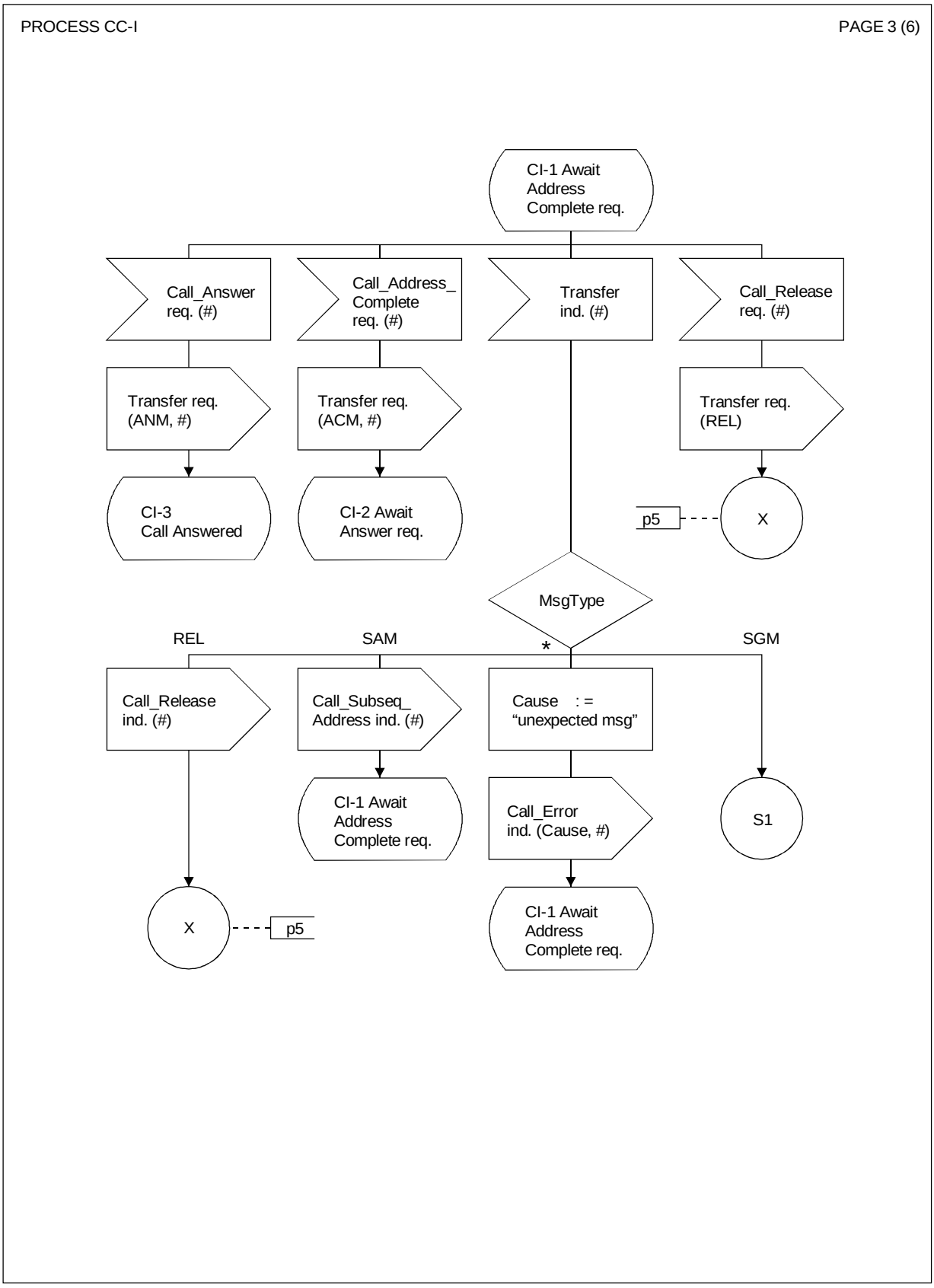


FIGURE 8-1/Q.2764 *(sheet 3 of 6)*

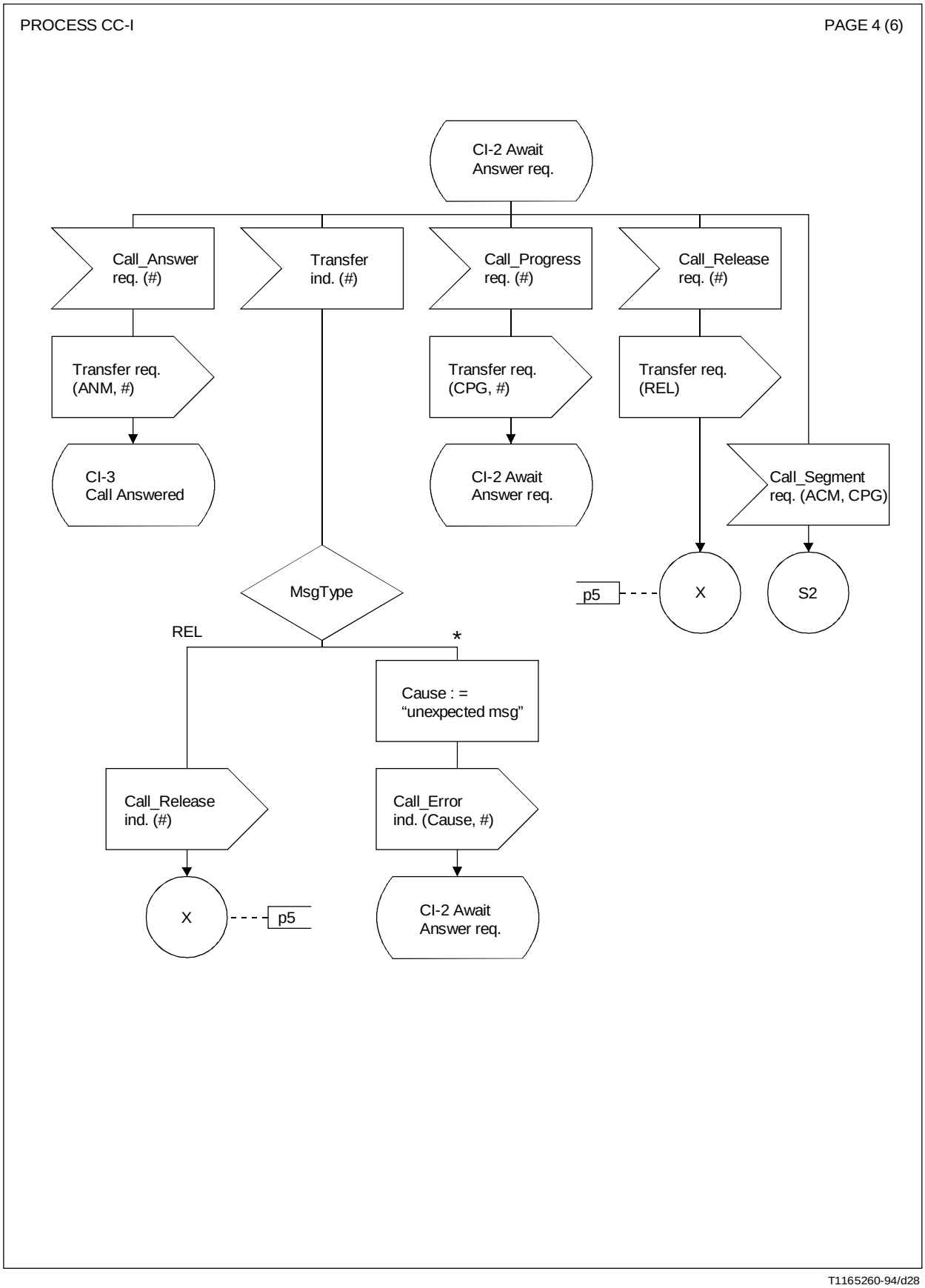


FIGURE 8-1/Q.2764 *(sheet 4 of 6)*

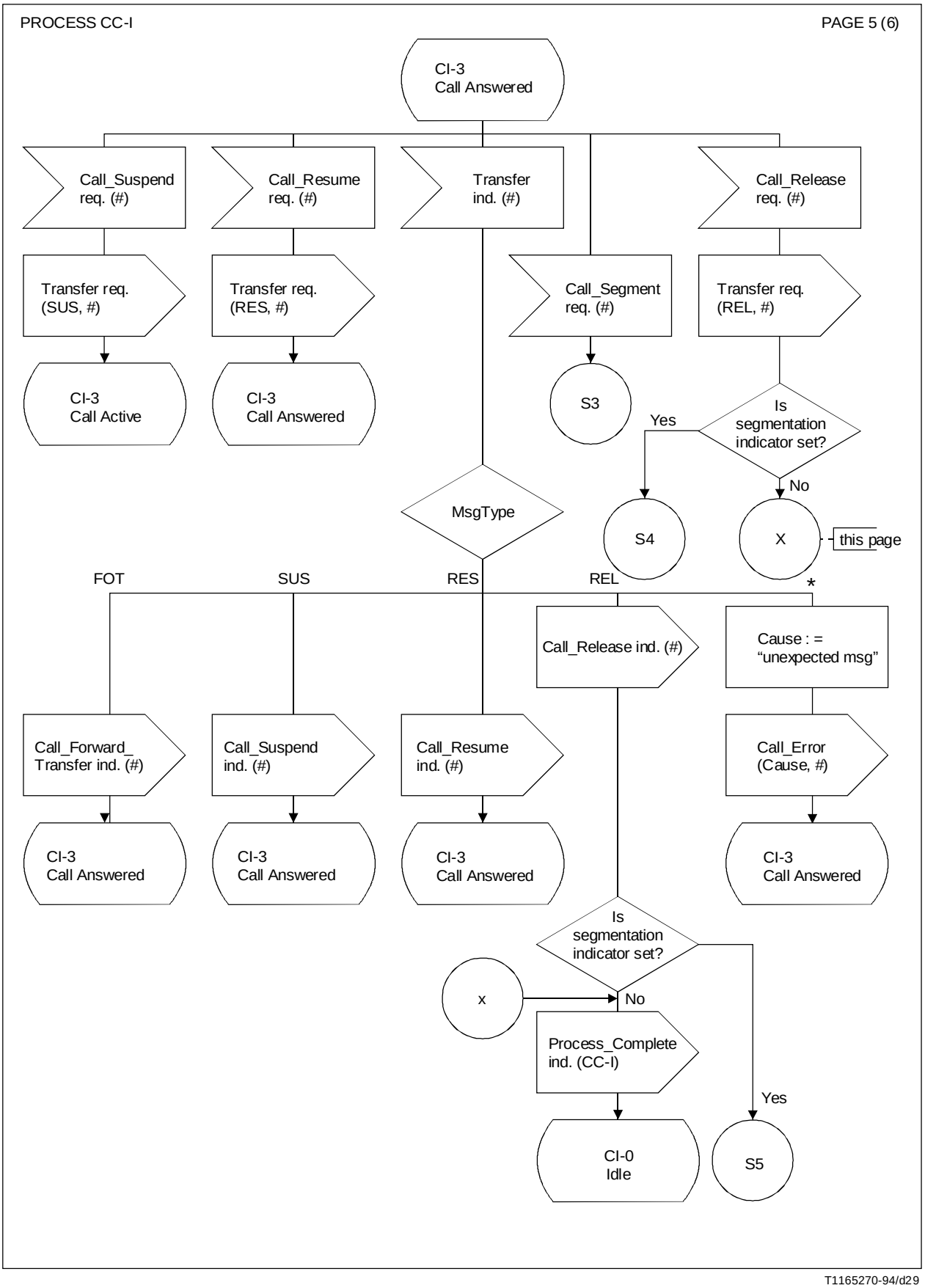


FIGURE 8-1/Q.2764 *(sheet 5 of 6)*

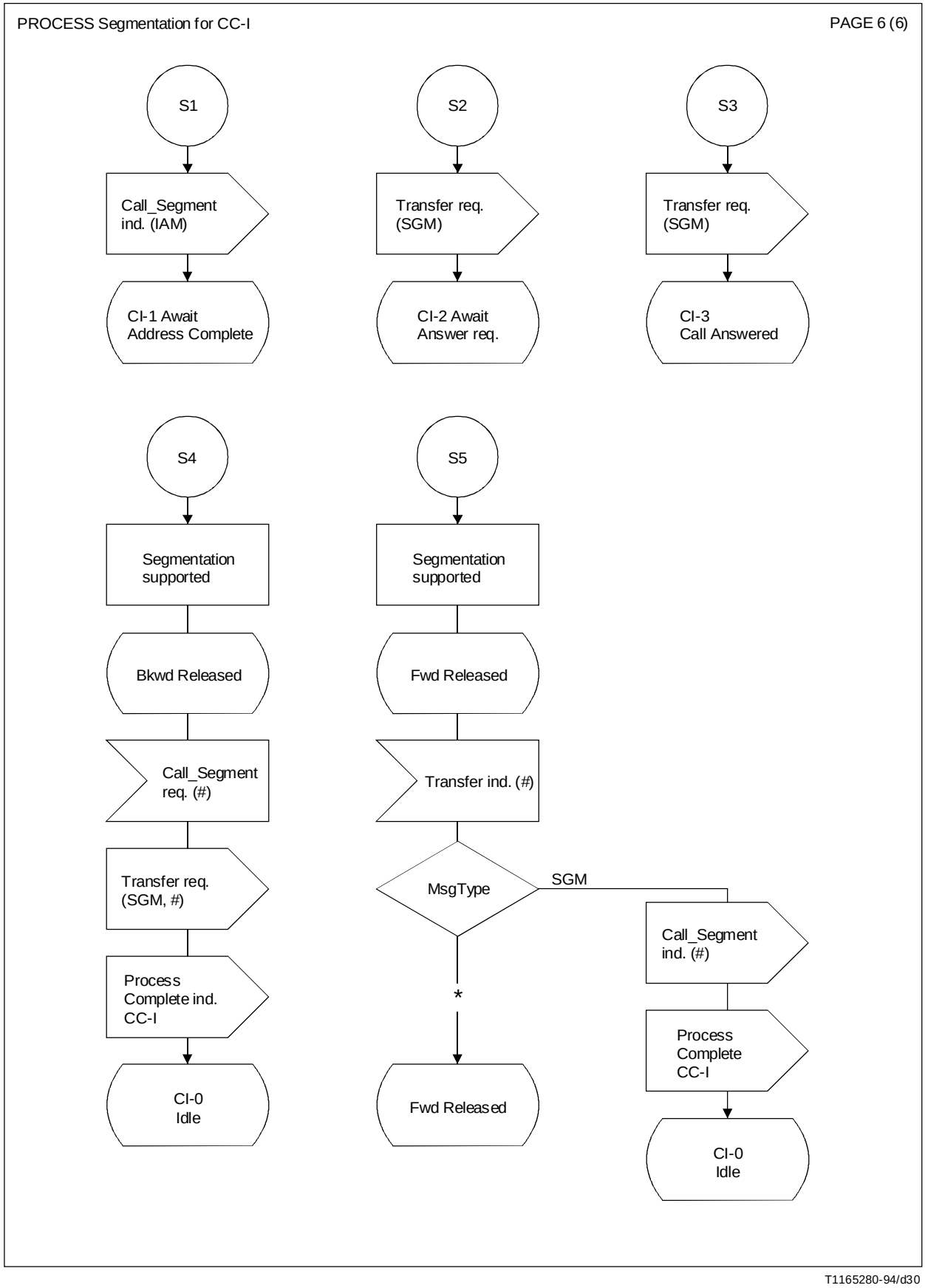


FIGURE 8-1/Q.2764 *(sheet 6 of 6)*

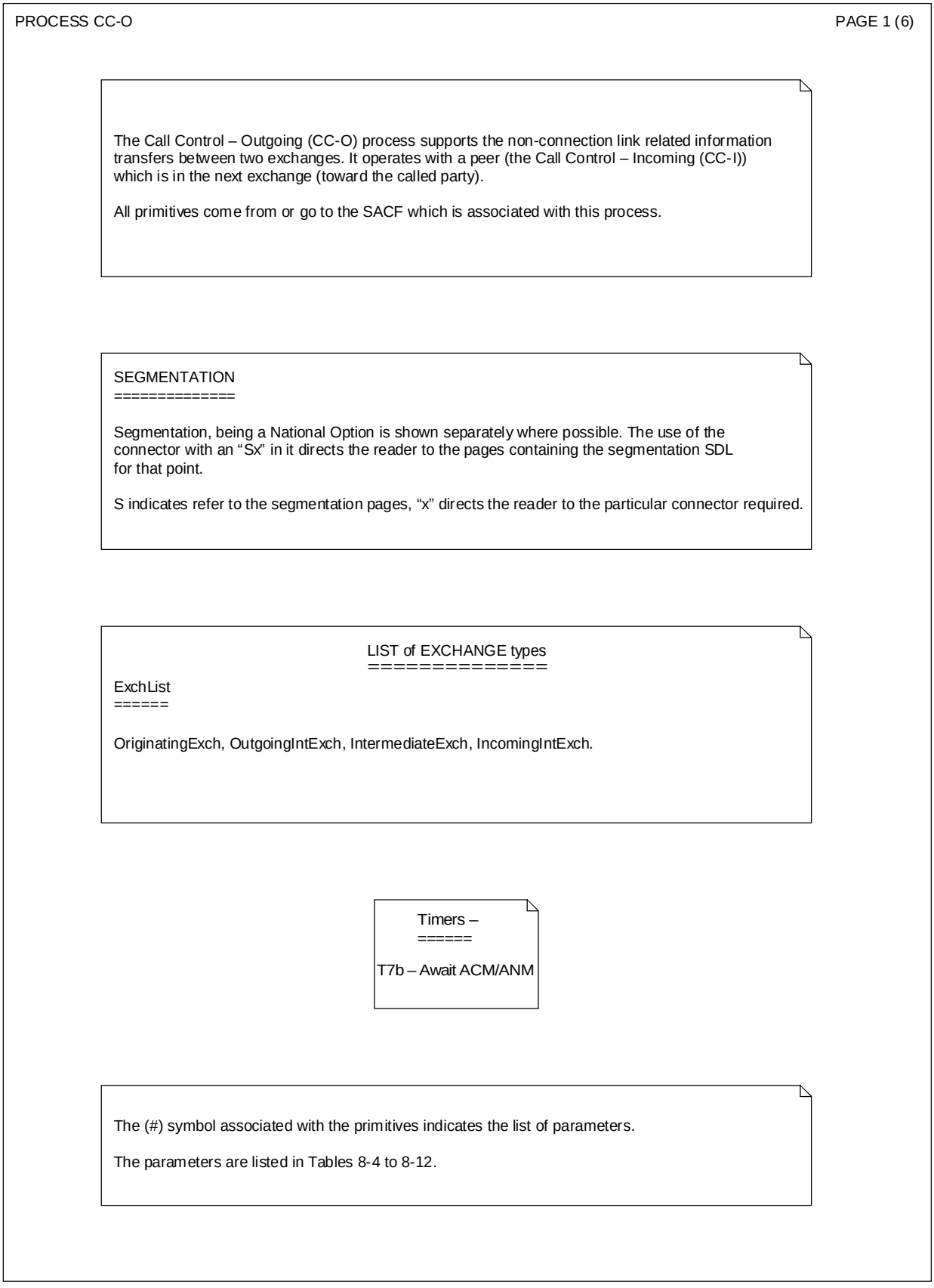


FIGURE 8-2/Q.2764 *(sheet 1 of 6)*

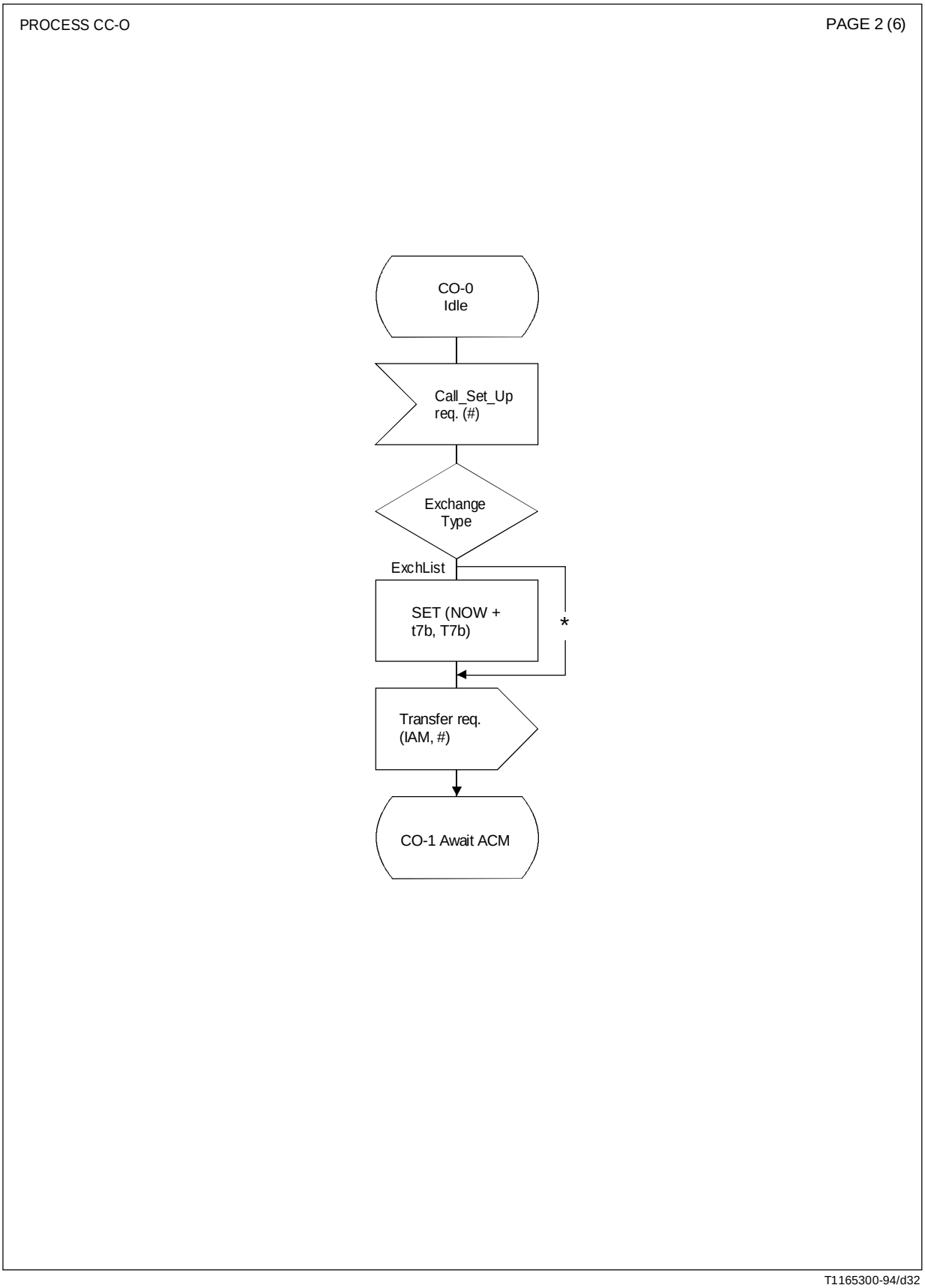


FIGURE 8-2/Q.2764 *(sheet 2 of 6)*

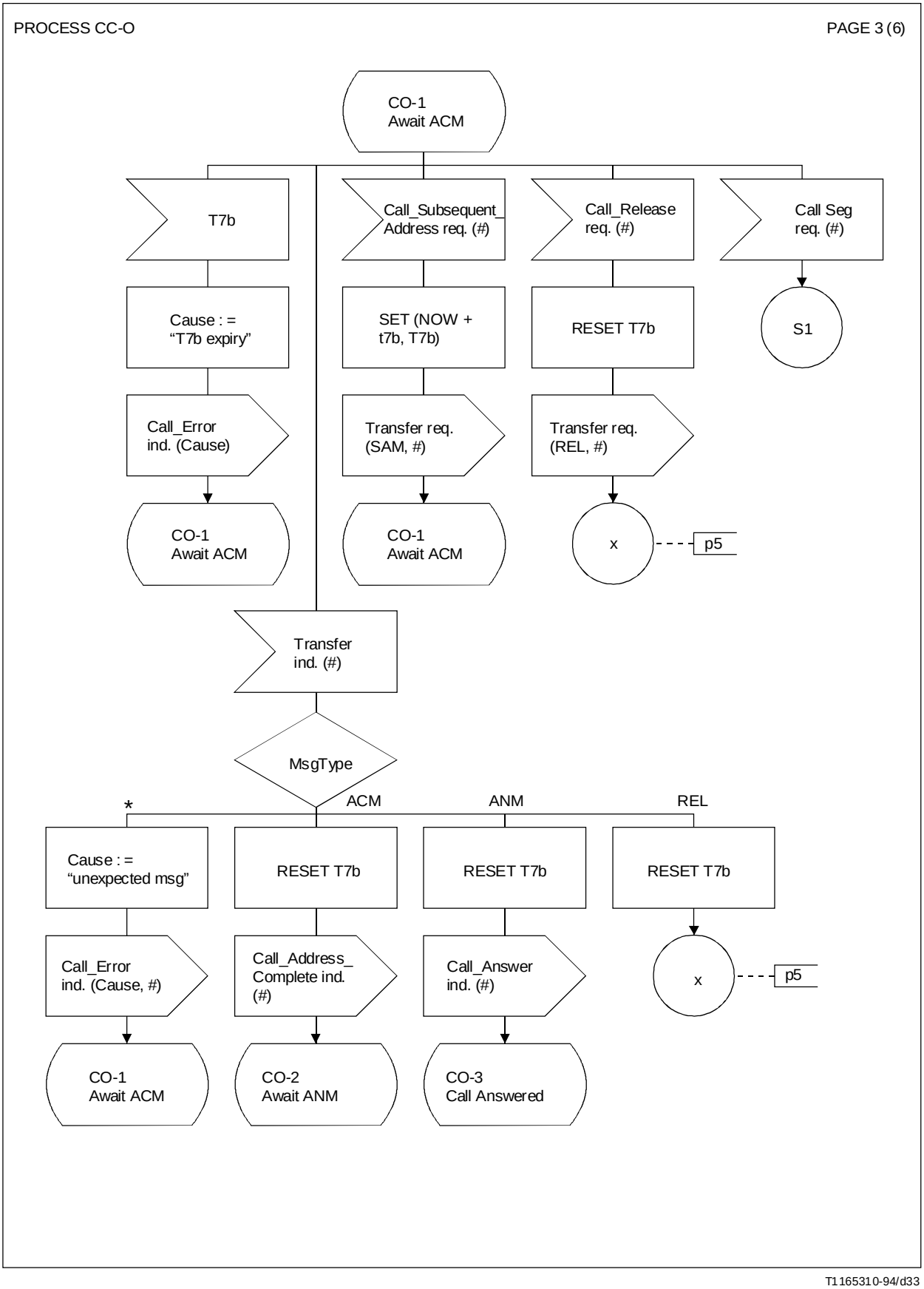


FIGURE 8-2/Q.2764 *(sheet 3 of 6)*

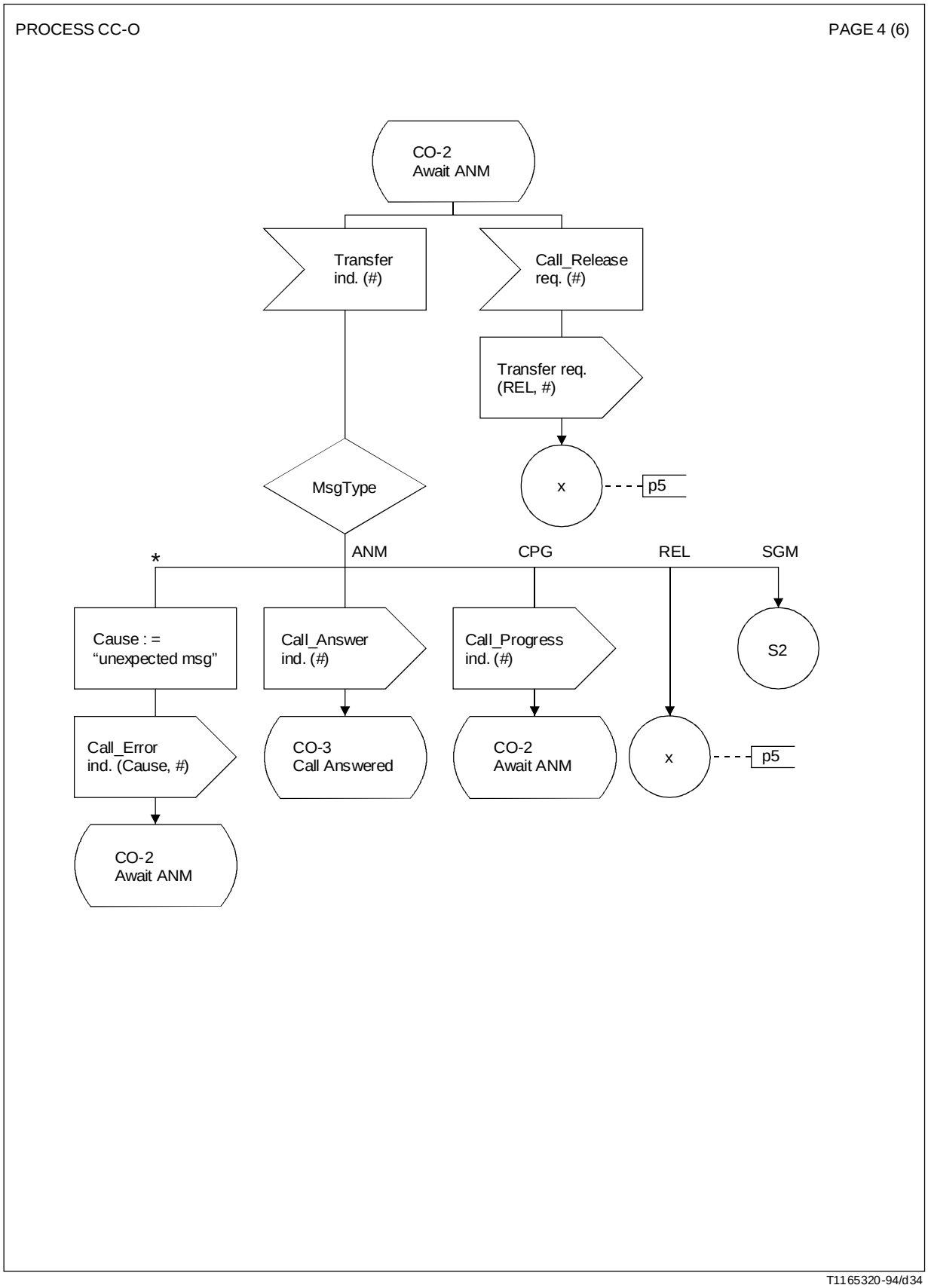


FIGURE 8-2/Q.2764 *(sheet 4 of 6)*

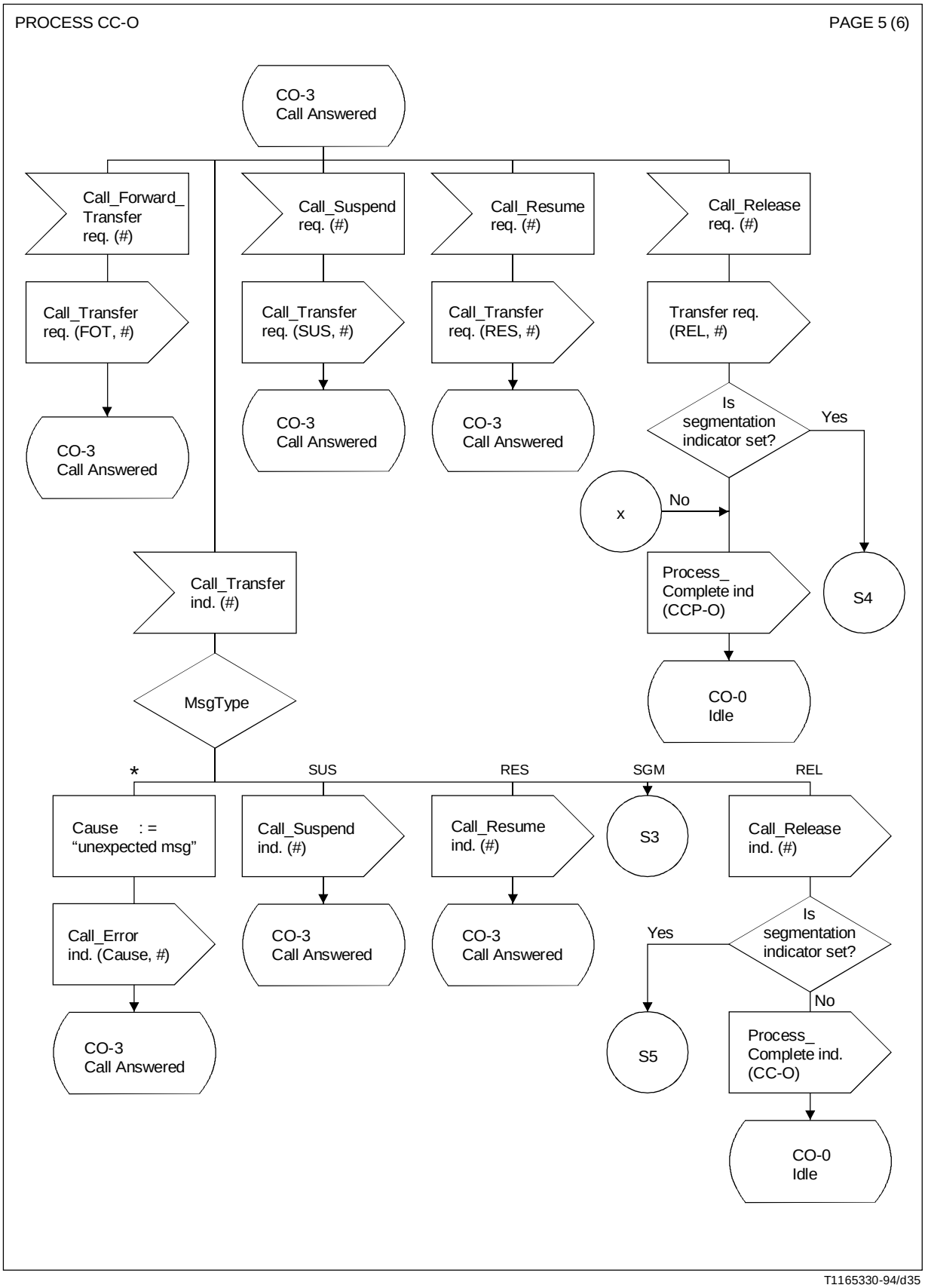


FIGURE 8-2/Q.2764 *(sheet 5 of 6)*

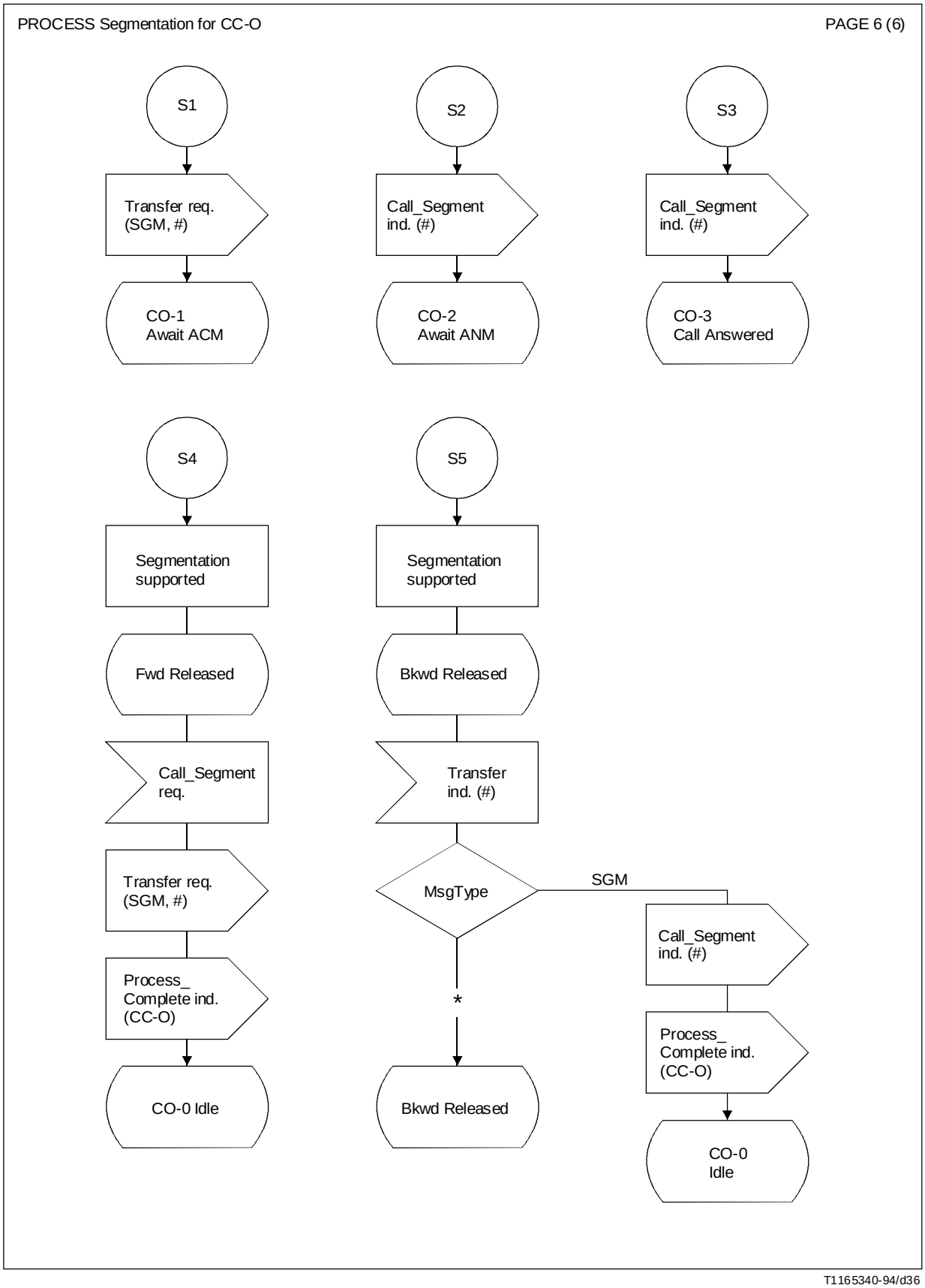


FIGURE 8-2/Q.2764 *(sheet 6 of 6)*

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

Superseded by a more recent version

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.)

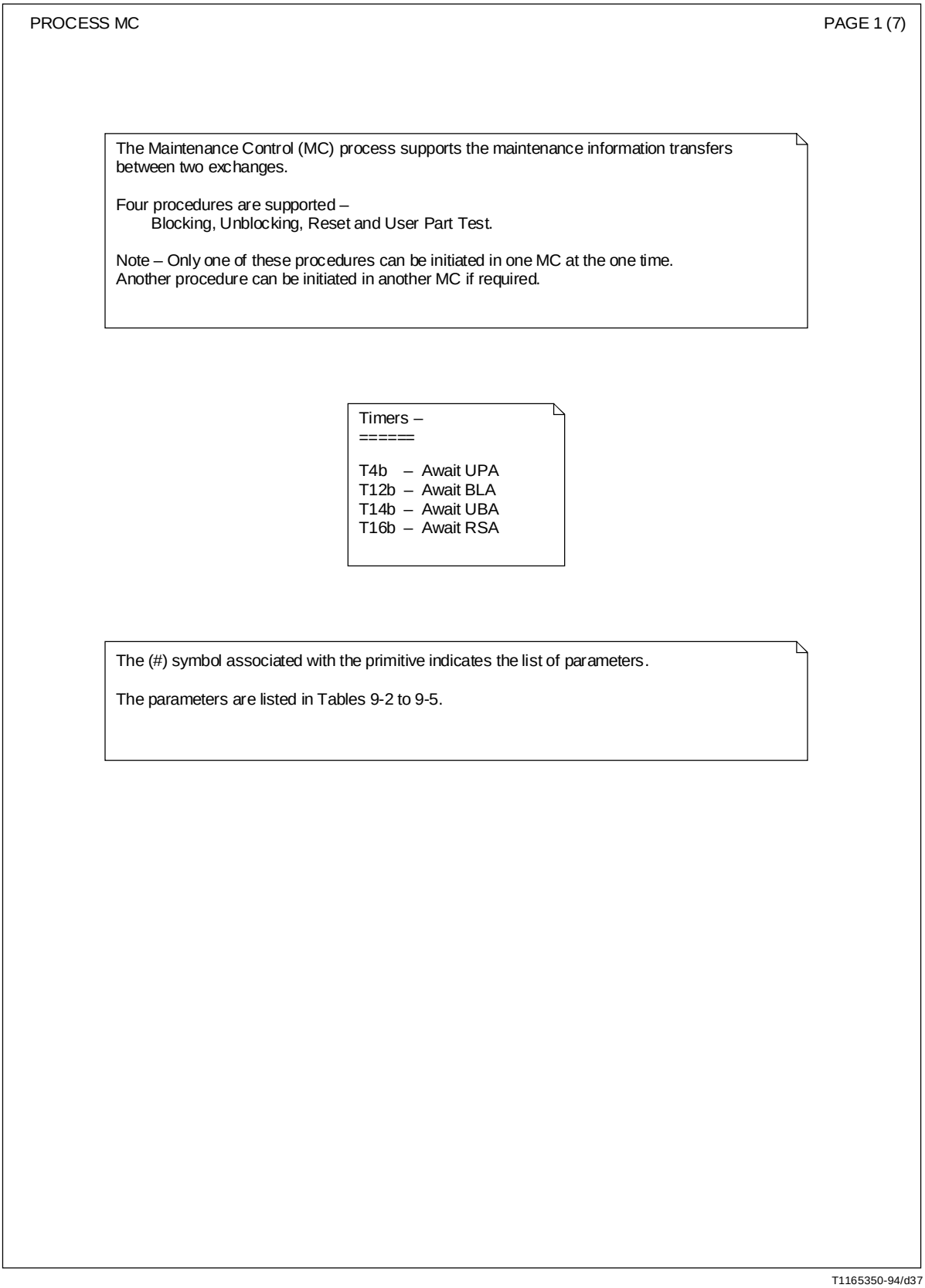


FIGURE 9-1/Q.2764 *(sheet 1 of 7)*

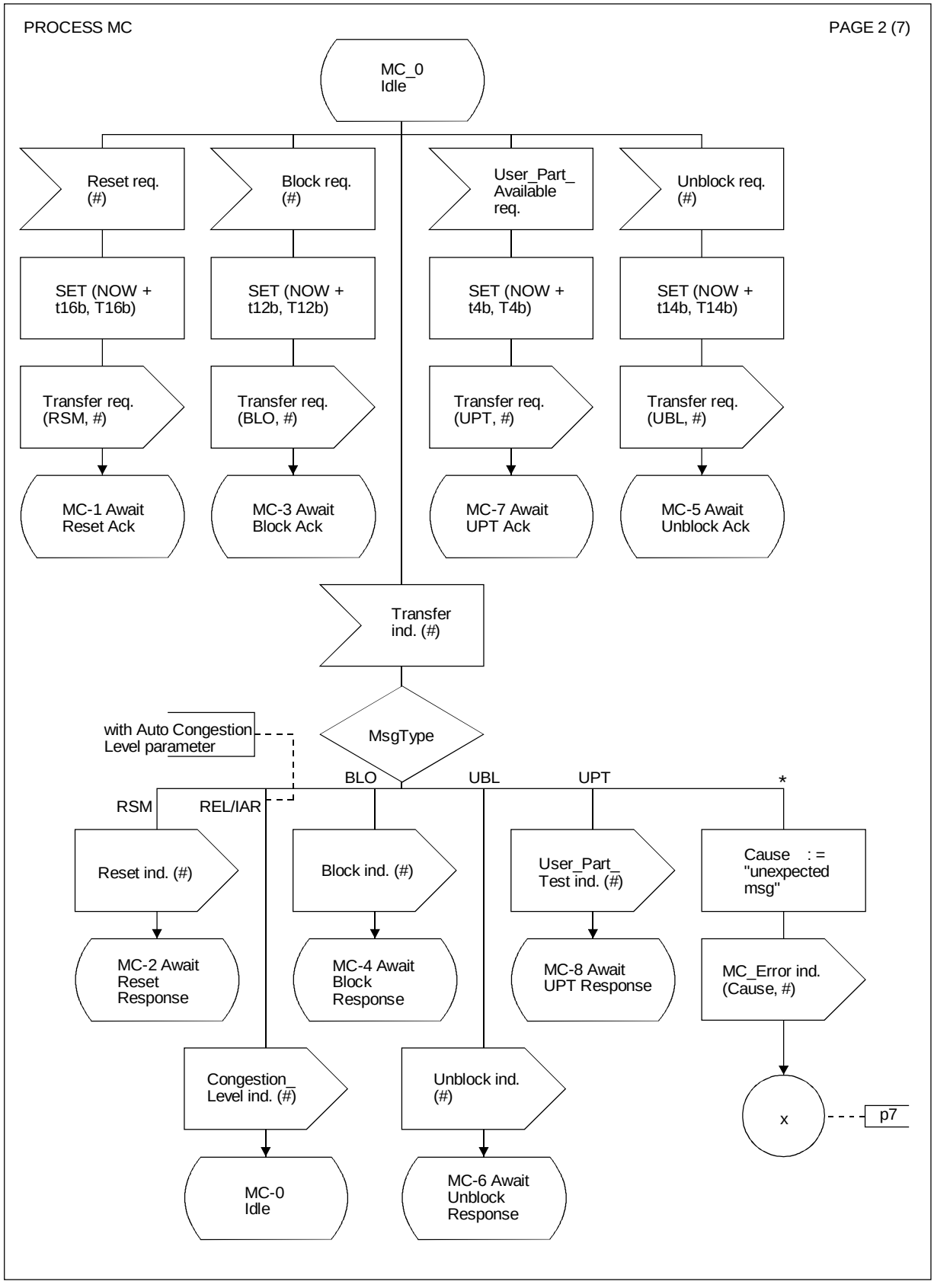


FIGURE 9-1/Q.2764 *(sheet 2 of 7)*

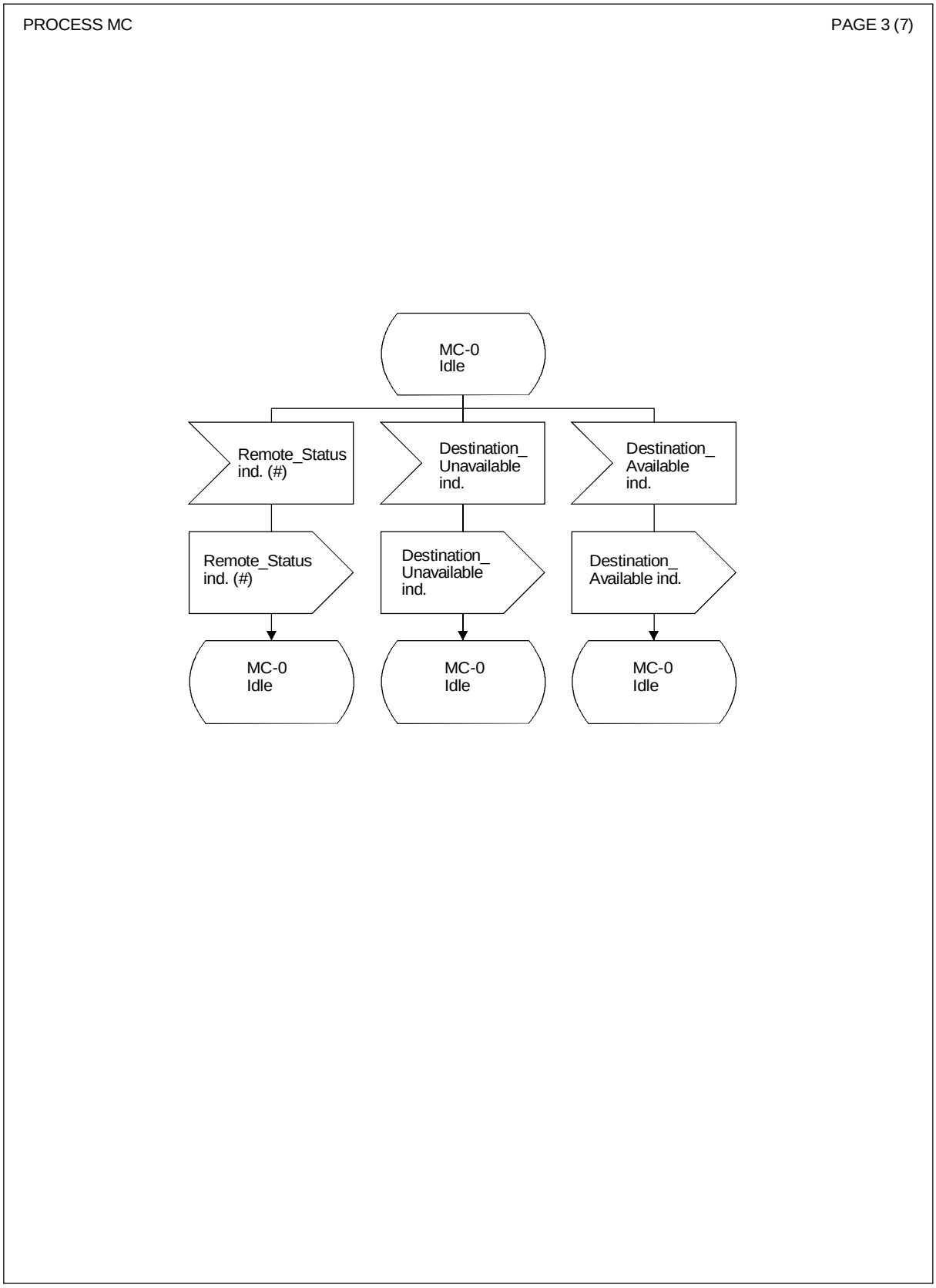


FIGURE 9-1/Q.2764 *(sheet 3 of 7)*

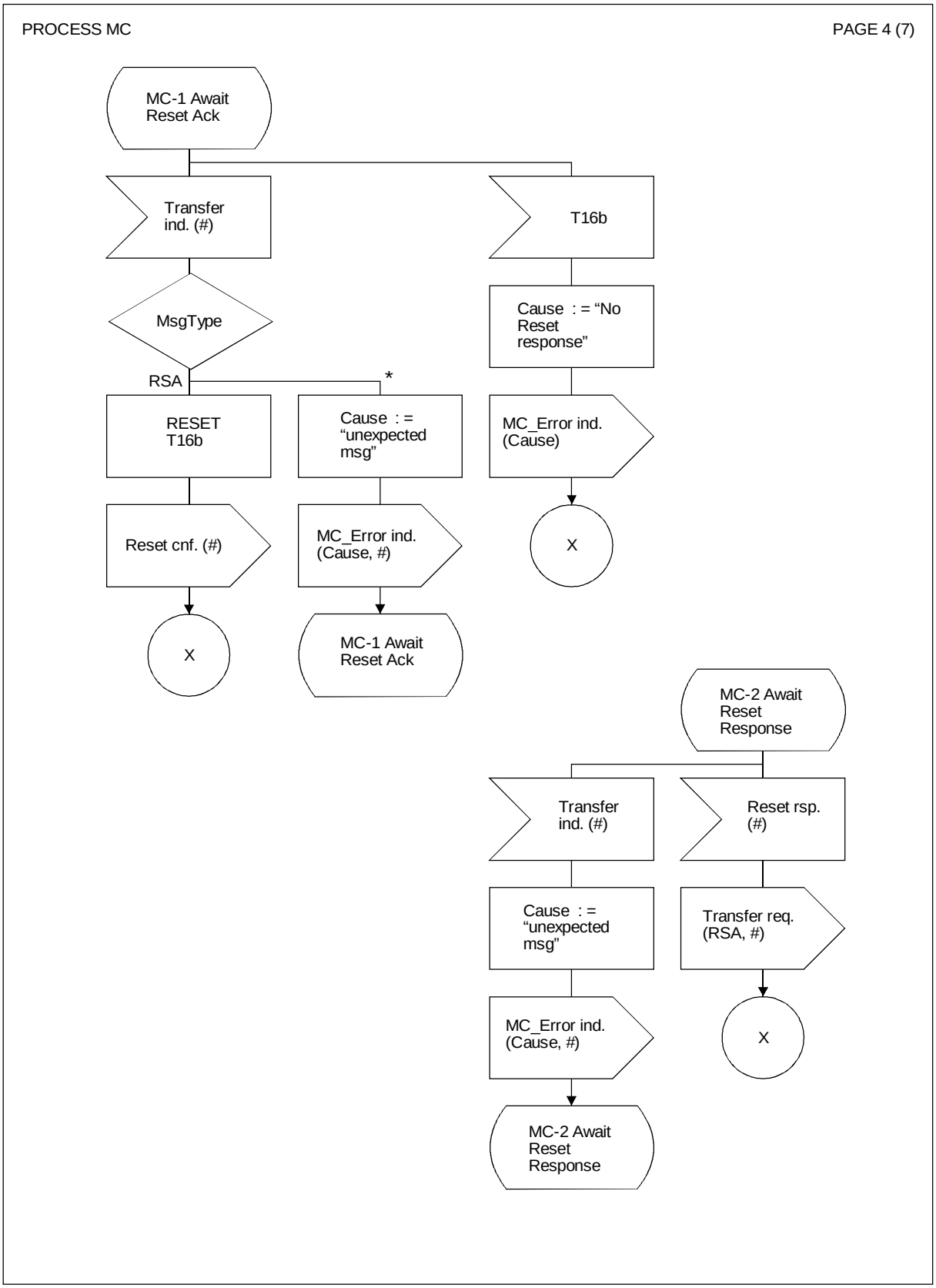


FIGURE 9-1/Q.2764 *(sheet 4 of 7)*

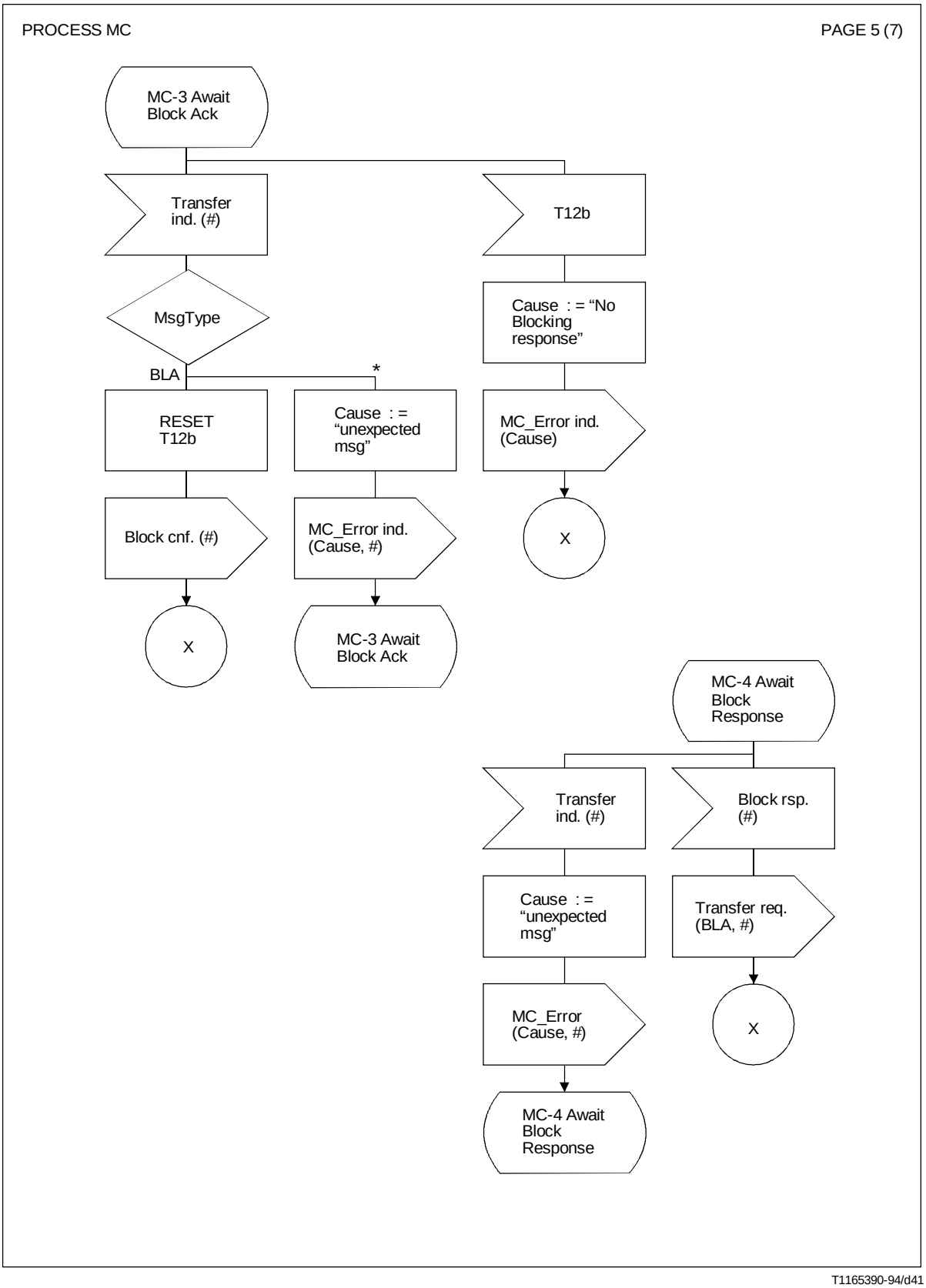


FIGURE 9-1/Q.2764 *(sheet 5 of 7)*

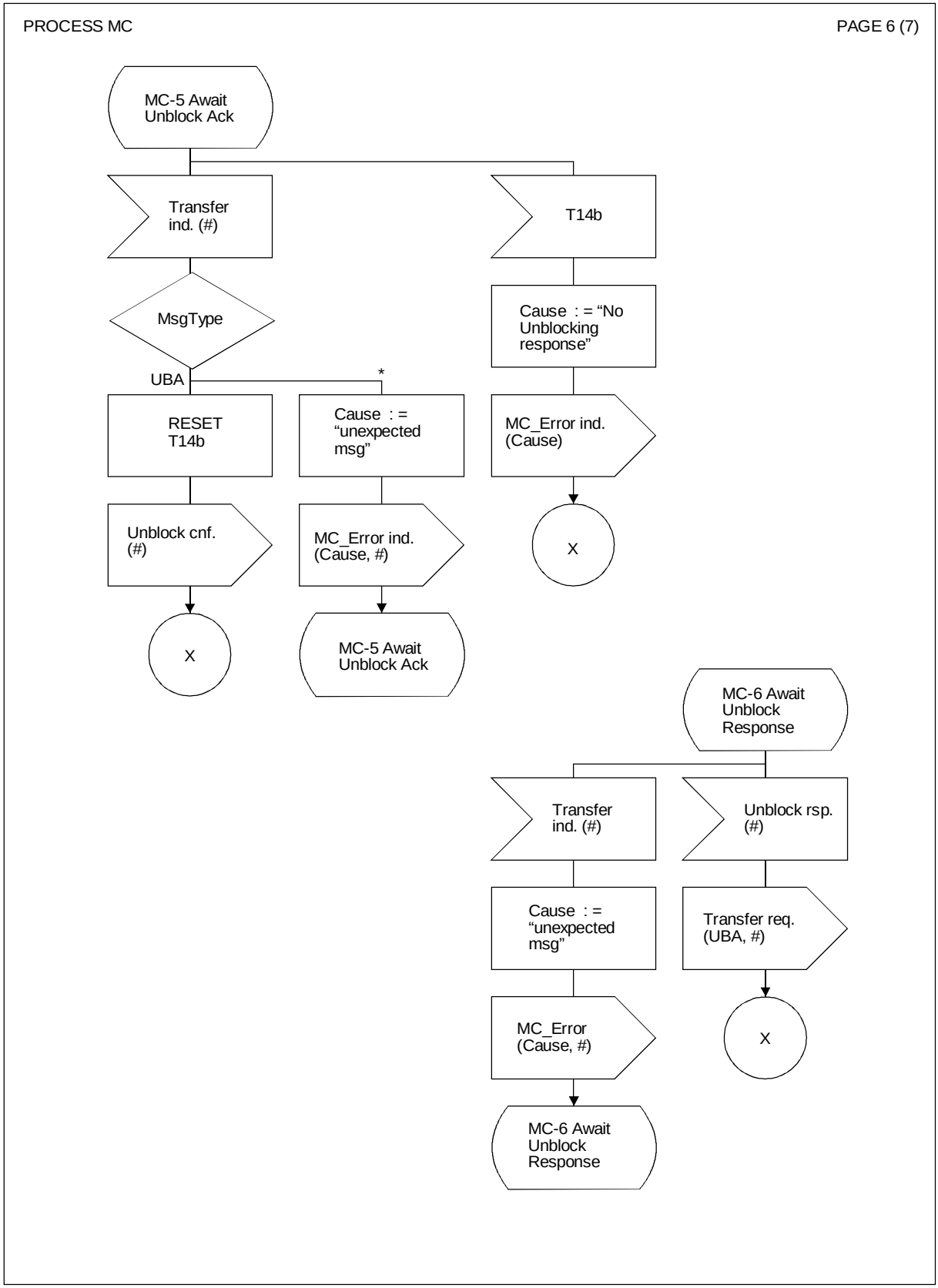


FIGURE 9-1/Q.2764 *(sheet 6 of 7)*

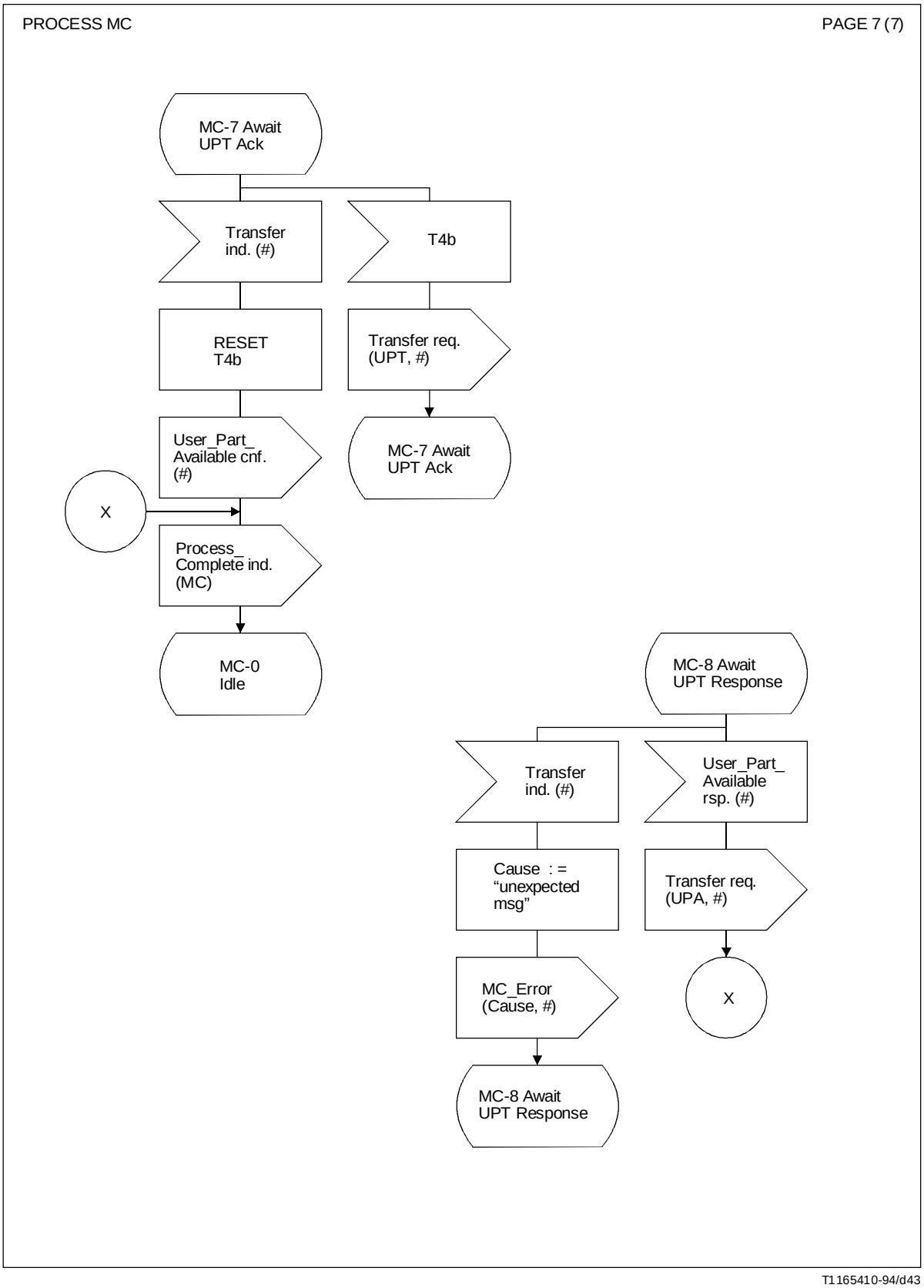


FIGURE 9-1/Q.2764 *(sheet 7 of 7)*

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.)

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 Table 11.)

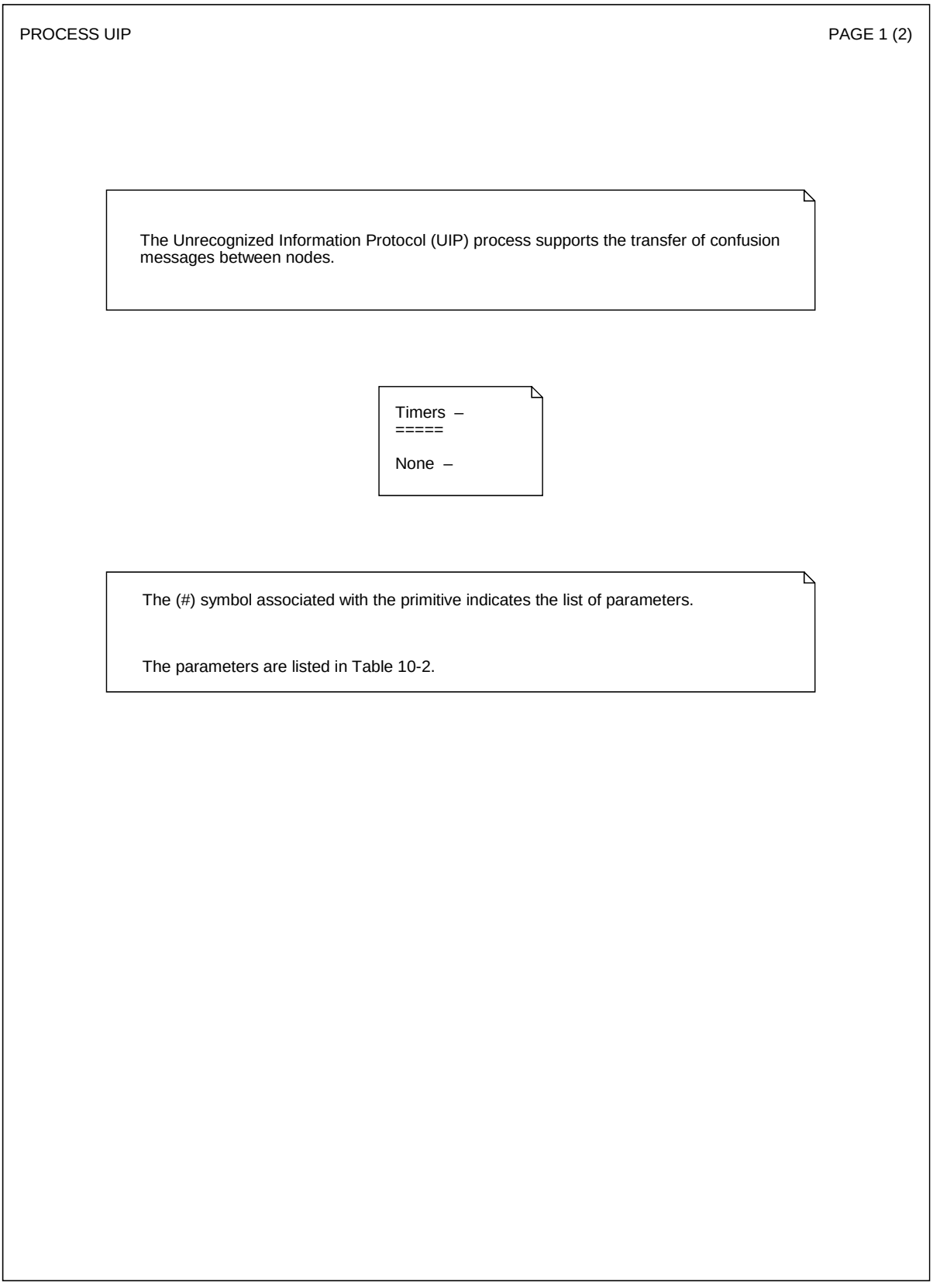


FIGURE 10-1/Q.2764*(sheet 1 of 2)*

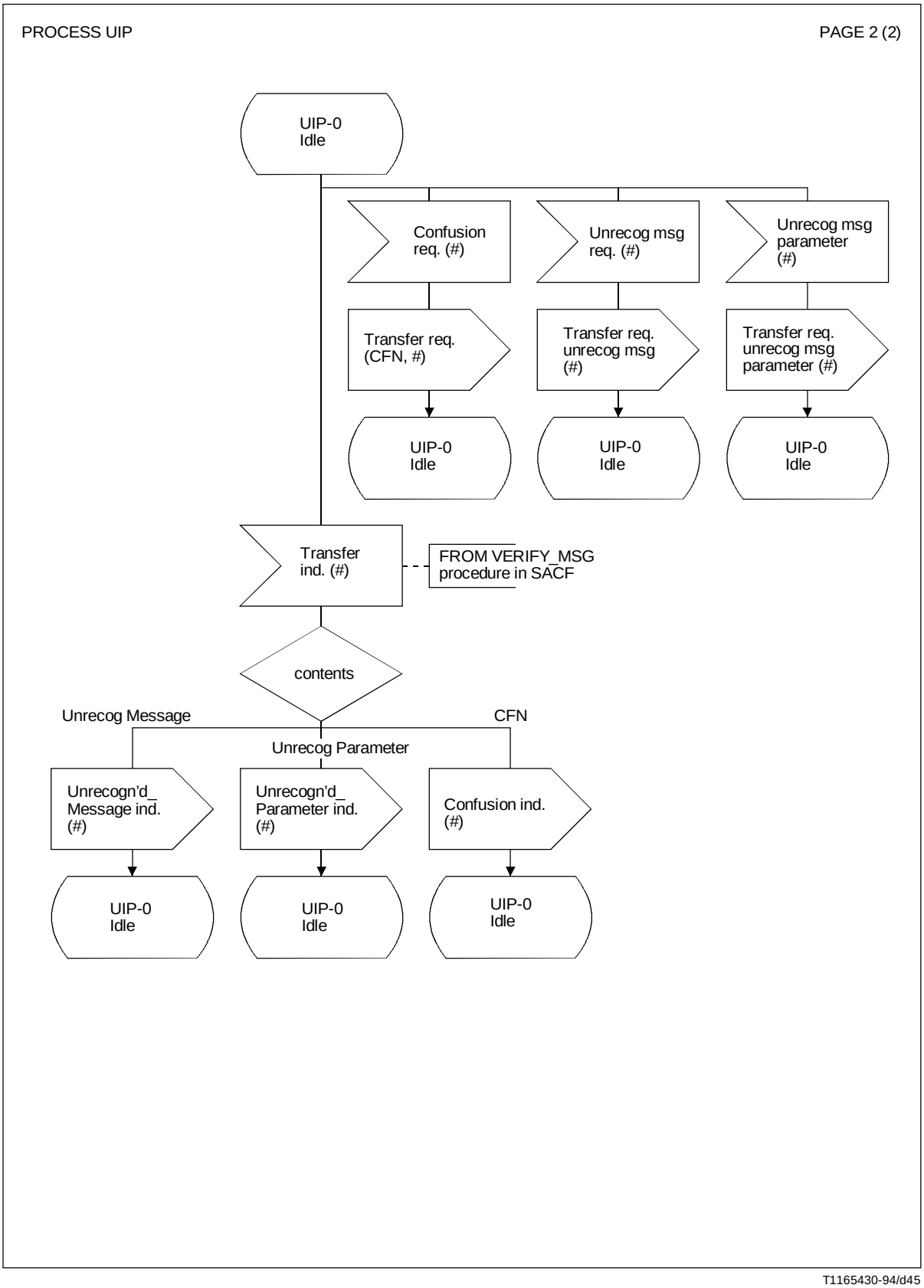


FIGURE 10-1/Q.2764 *(sheet 2 of 2)*

TABLE 11/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	2.7, 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 (or any other)	Send User Part Test message. Start T4b	9.4
Await Network Resume (T6b)	As specified in Rec. 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)	2.7, 8
Await answer (T9b)	As specified in Rec. Q.118	When national controlling or outgoing international exchange receives Address Complete message	At the receipt of Answer message	Release connection, send Release message	2.2.3, 2.2.5
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 Reset Acknowledgement is not received within timer "Await Reset Acknowledgement"	–	Resend Reset message, Alert maintenance	3.2.3

TABLE 11/Q.2764 *(end)*

Timers in B-ISUP

Symbol (name)	Time-out value	Cause for initiation	Normal termination	At expiry	Reference
Short SC (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	2.2.9
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 Rec. 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	3.2, 7.2
Await Consistency Check Request Acknowledgement (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 Acknowledgement (T42b)	15-60 seconds	When Consistency Check End message is sent	At receipt of Consistency Check End Acknowledgement	Alert Maintenance system	9.6

Annex A

B-ISUP specification model

(This annex forms an integral part of this Recommendation)

A.1 Introduction

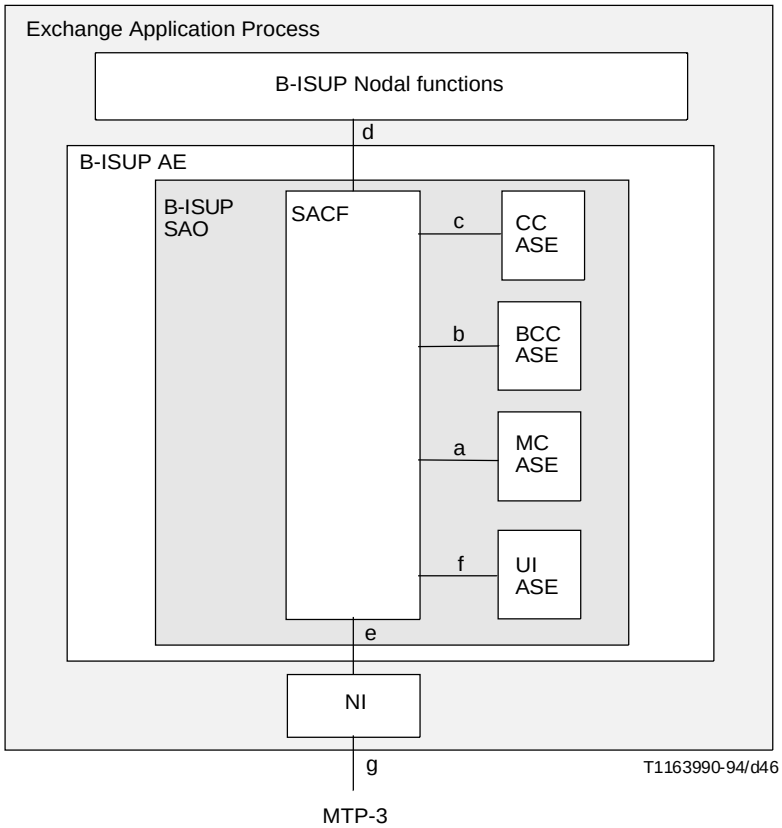
The model used to structure the description of B-ISUP procedures is based on the OSI Application Layer Structure (ALS) model, see Recommendation Q.1400. This annex presents the model and gives a general description of its operation.

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 Recommendation.



AE	Application Entity
SACF	Single Association Control Function
ASE	Application Service Element
CC	Call Control
BCC	Bearer Connection Control
MC	Maintenance Control
NI	Network Interface
SAO	Single Association Object
UI	Unrecognized Information

FIGURE A.1/Q.2764

B-ISUP 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.

NOTES

1 Only one SACF description is provided. Different subsets of this description are used for each of the SAO types mentioned above.

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.

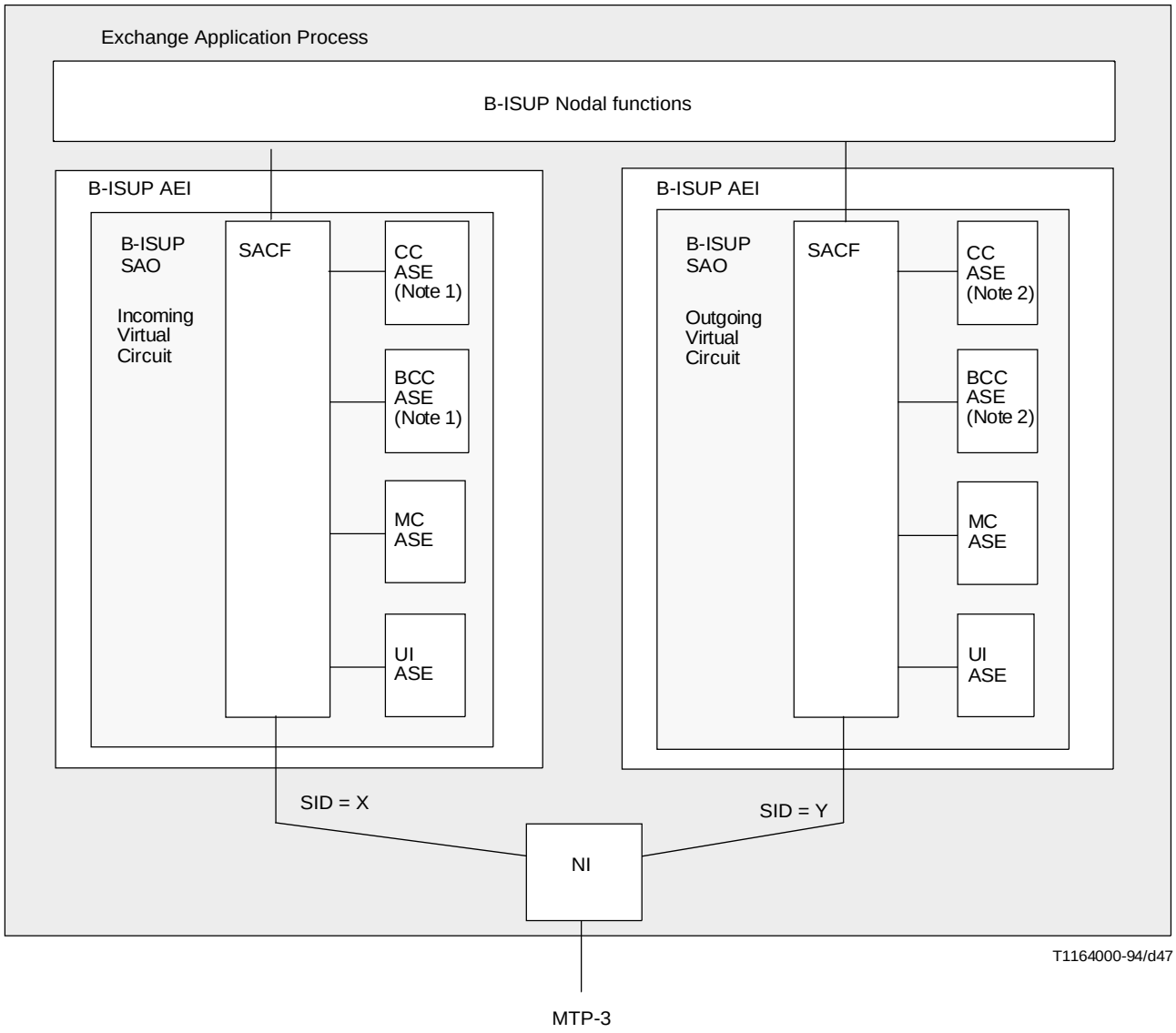
To handle any particular B-ISUP function, the Exchange Application Process creates an instance of the required B-ISUP Nodal functions. B-ISUP will create instances, as required, of the B-ISUP AE. This is further discussed in the following subclause.

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.



NOTES

1 The Incoming ASE type is used.

2 The Outgoing ASE type is used.

FIGURE A.2/Q.2764

Model of intermediate exchange

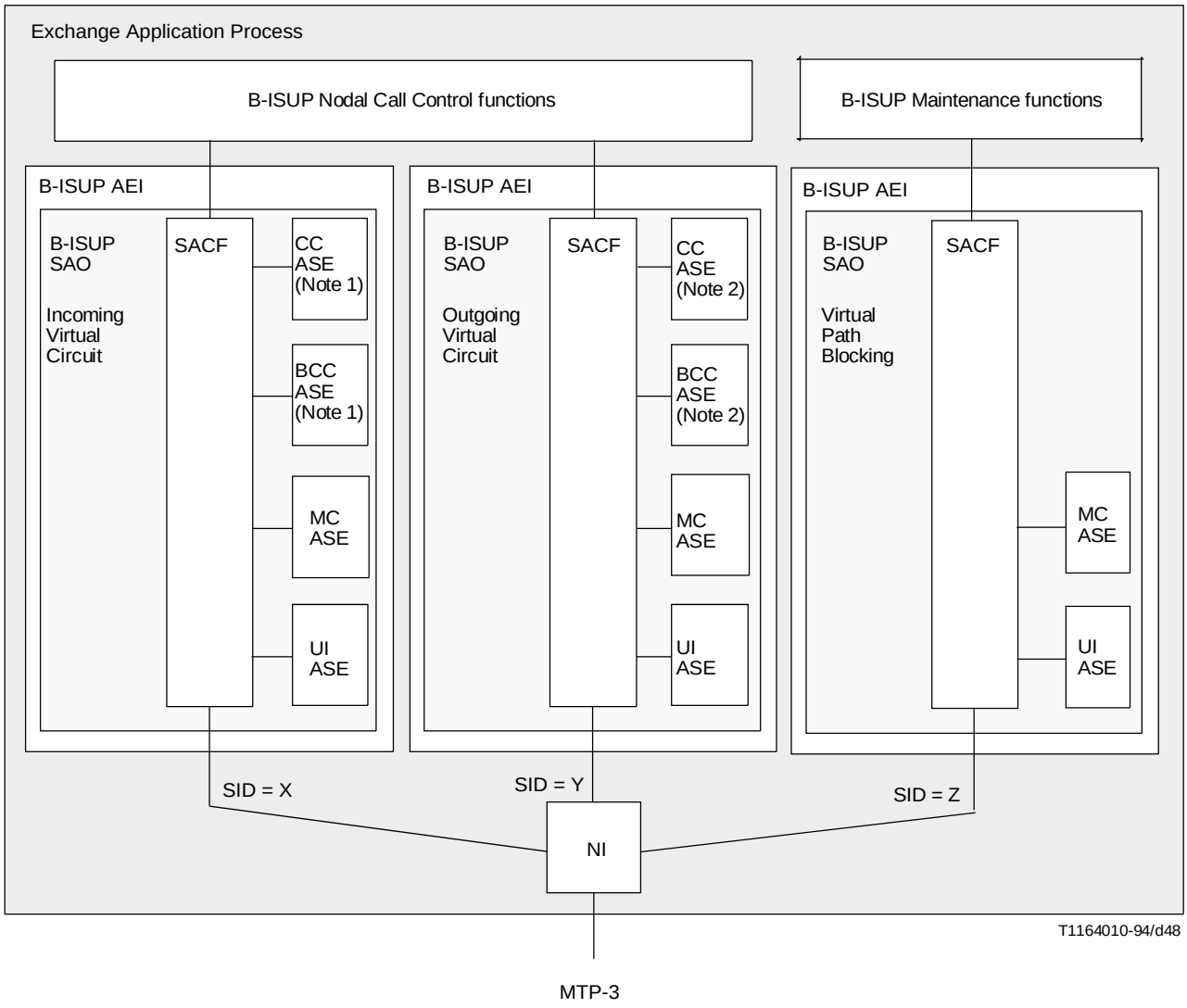
Figure A.3 shows an additional example where a maintenance function is in progress. The maintenance function is blocking a Virtual Path used by the call/connection in progress. In this case there can be interactions between the call/connection and the blocking procedure; the Exchange Application Process 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, eg. 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.



NOTES

1 The Incoming ASE type is used.

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, eg. 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, eg. 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.

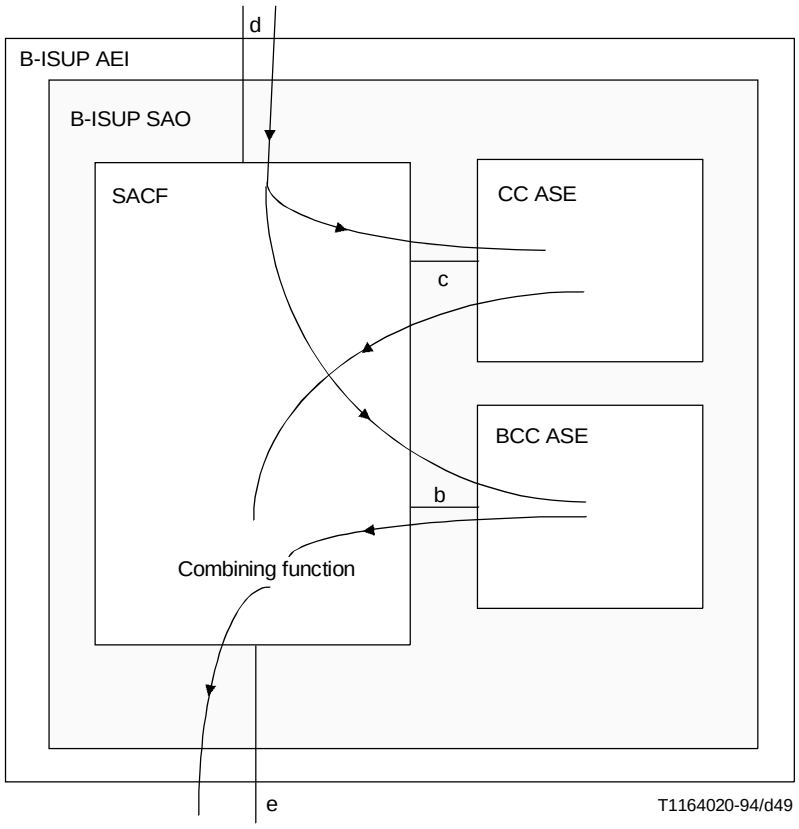


FIGURE A.4/Q.2764

Example of SACF functions when sending a message

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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 subclause 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.

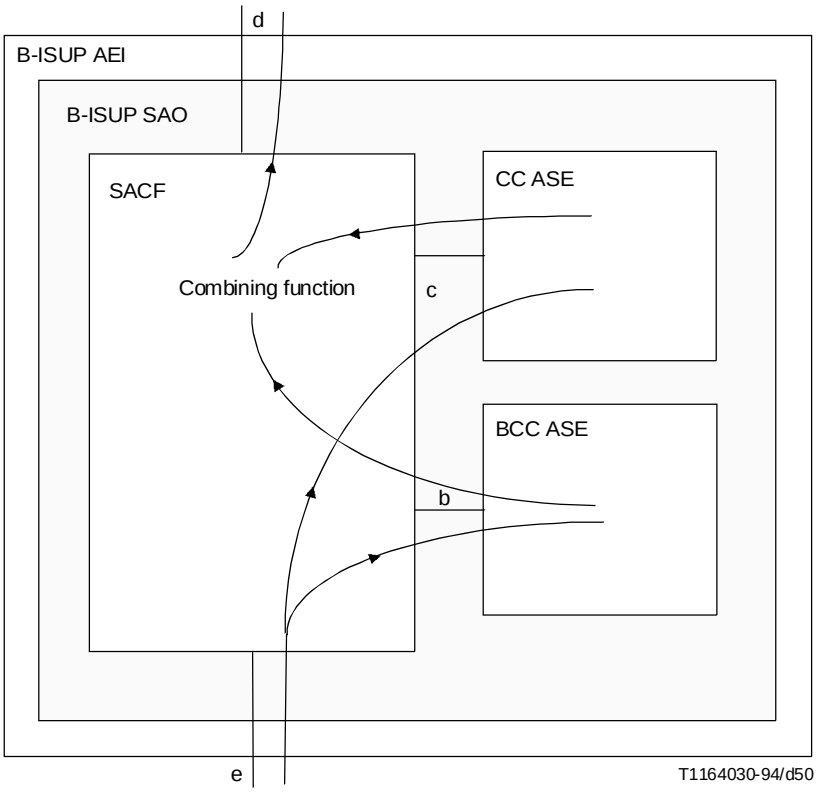


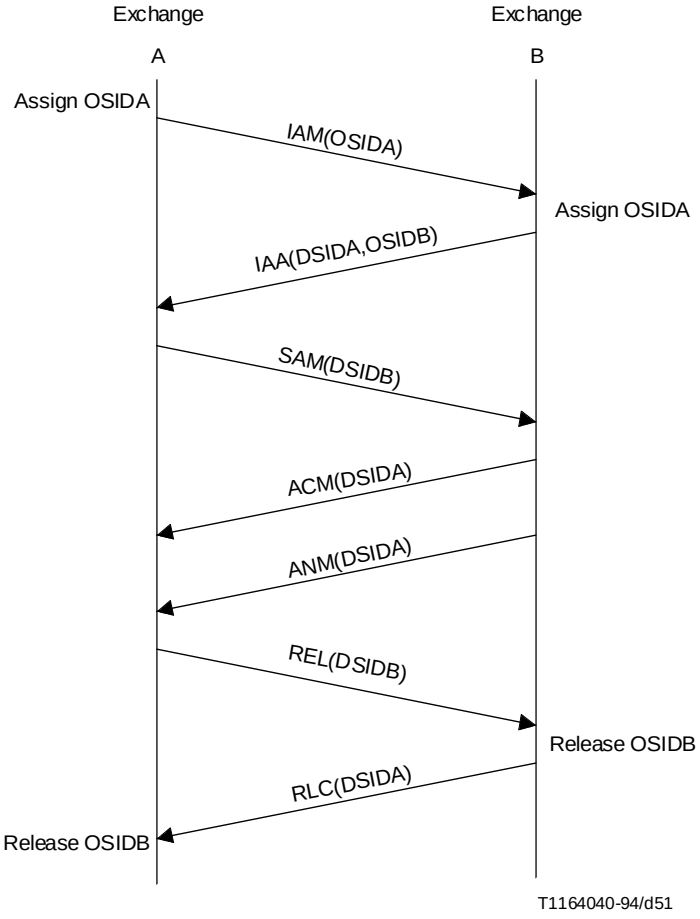
FIGURE A.5/Q.2764

Example of SACF functions when receiving a message

Annex B

B-ISUP example call set-up sequences

(This annex forms an integral part of this Recommendation)



OSIDA	Origination Signalling ID assigned by exchange A
OSIDB	Origination Signalling ID assigned by exchange B
DSIDA	Destination Signalling ID A (= OSIDA)
DSIDB	Destination Signalling ID B (= OSIDB)

FIGURE B.1/Q.2764

Example of a scenario for assigning and releasing of the signalling associations; only the SID-Parameters of the messages are shown

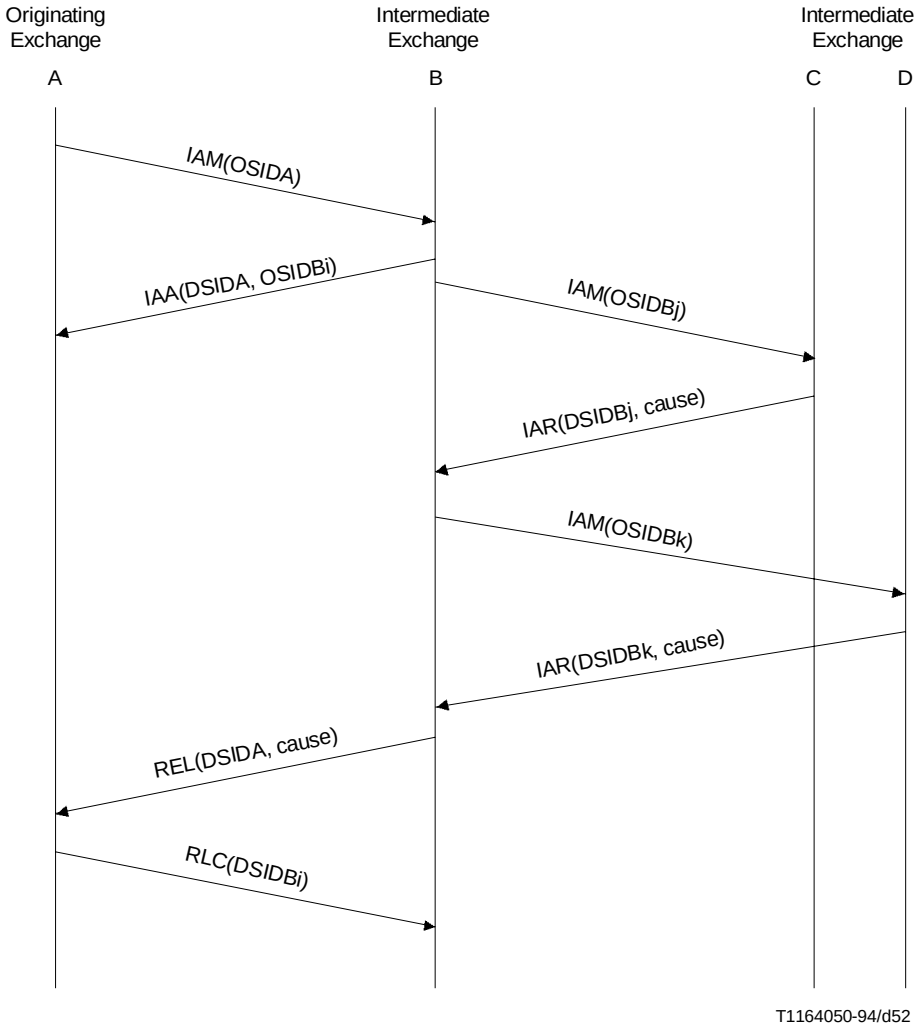


FIGURE B.2/Q.2764

Example unsuccessful call/connection set-up sequence

Annex C

SDL overview

(This annex forms an integral part of this Recommendation)

C.1 Introduction

This annex gives an overview of the structure of the SDL diagrams found in the various text references of the Recommendation. (See Figures C.1 to C.5.)

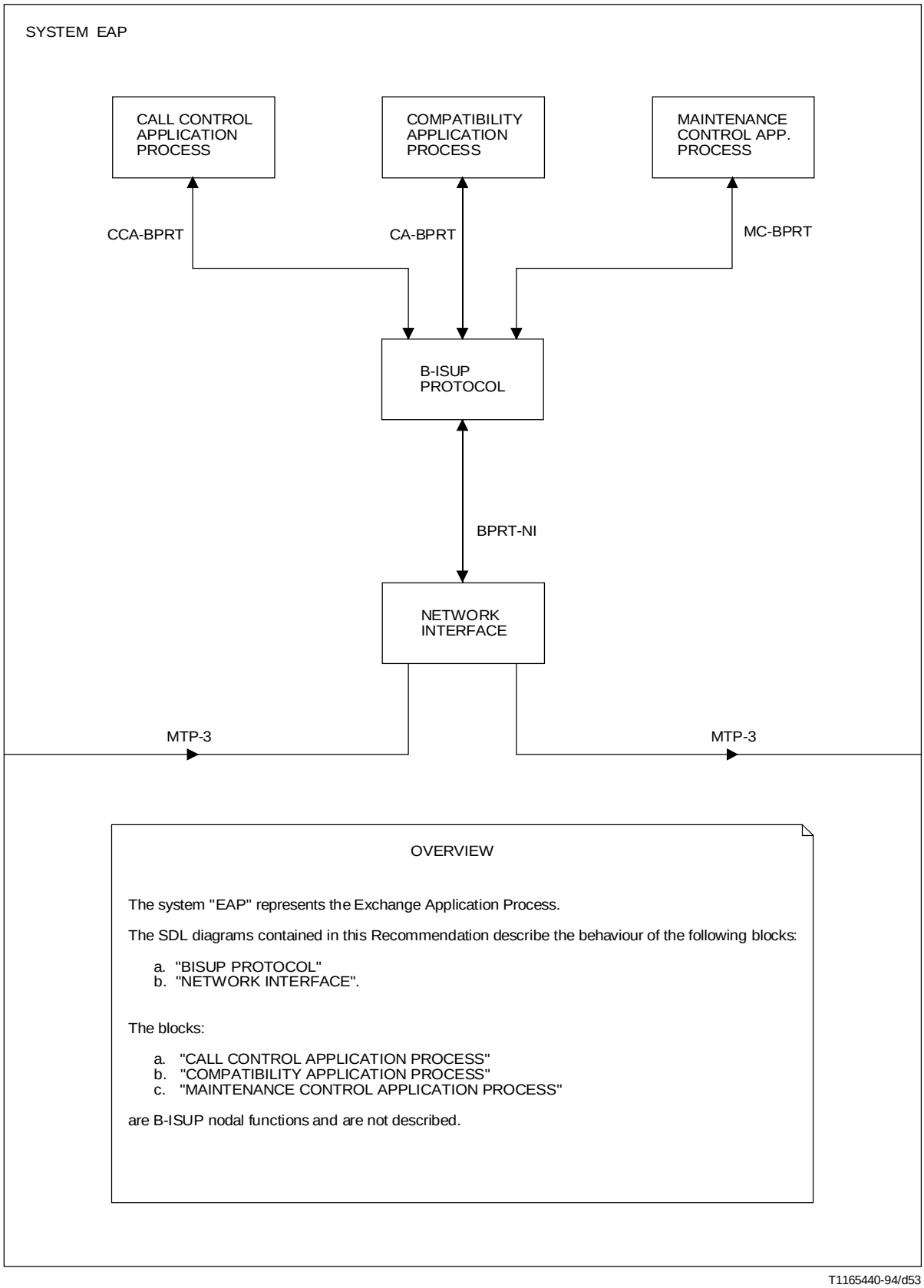


FIGURE C.1/Q.2764

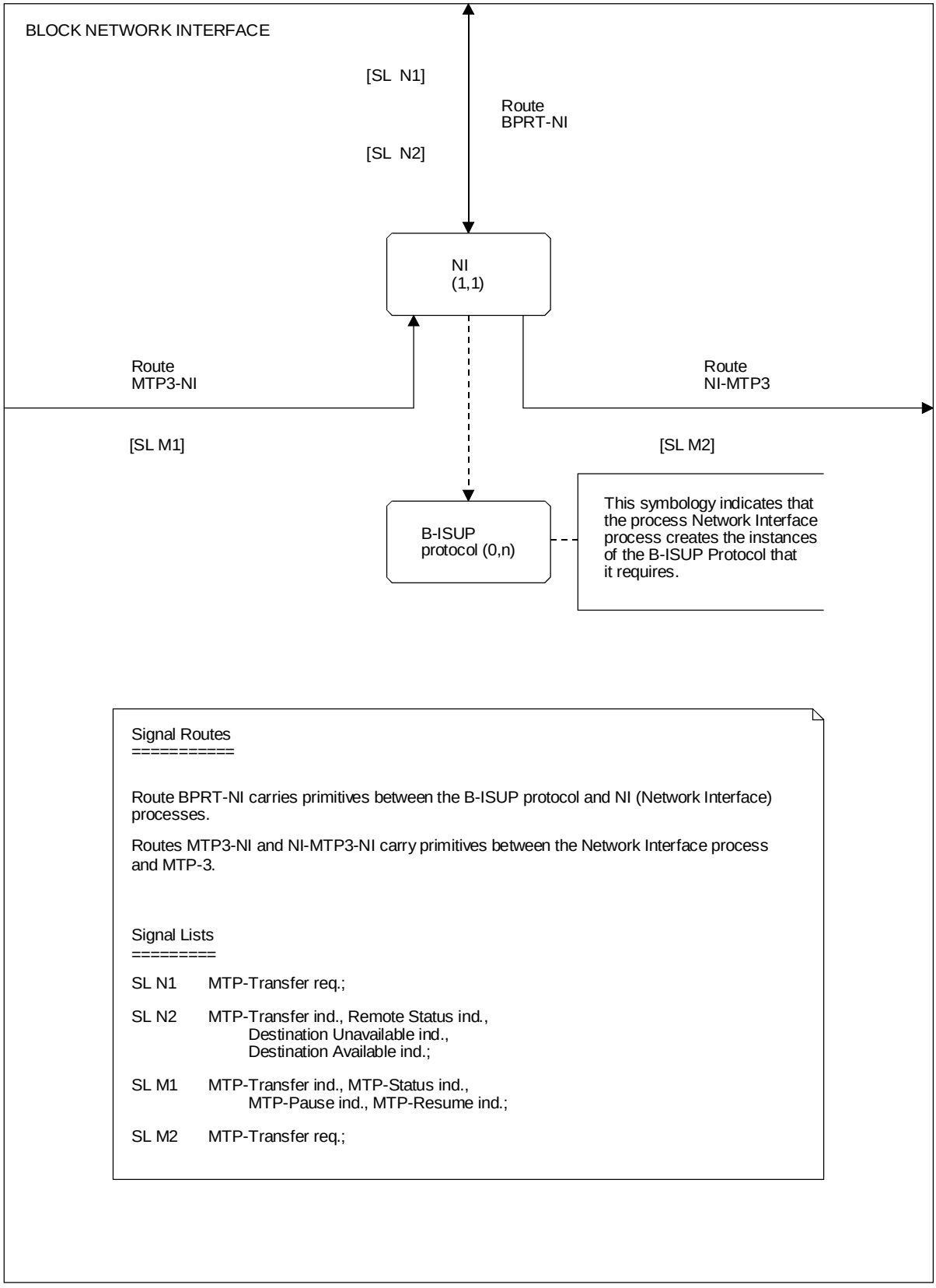


FIGURE C.2/Q.2764

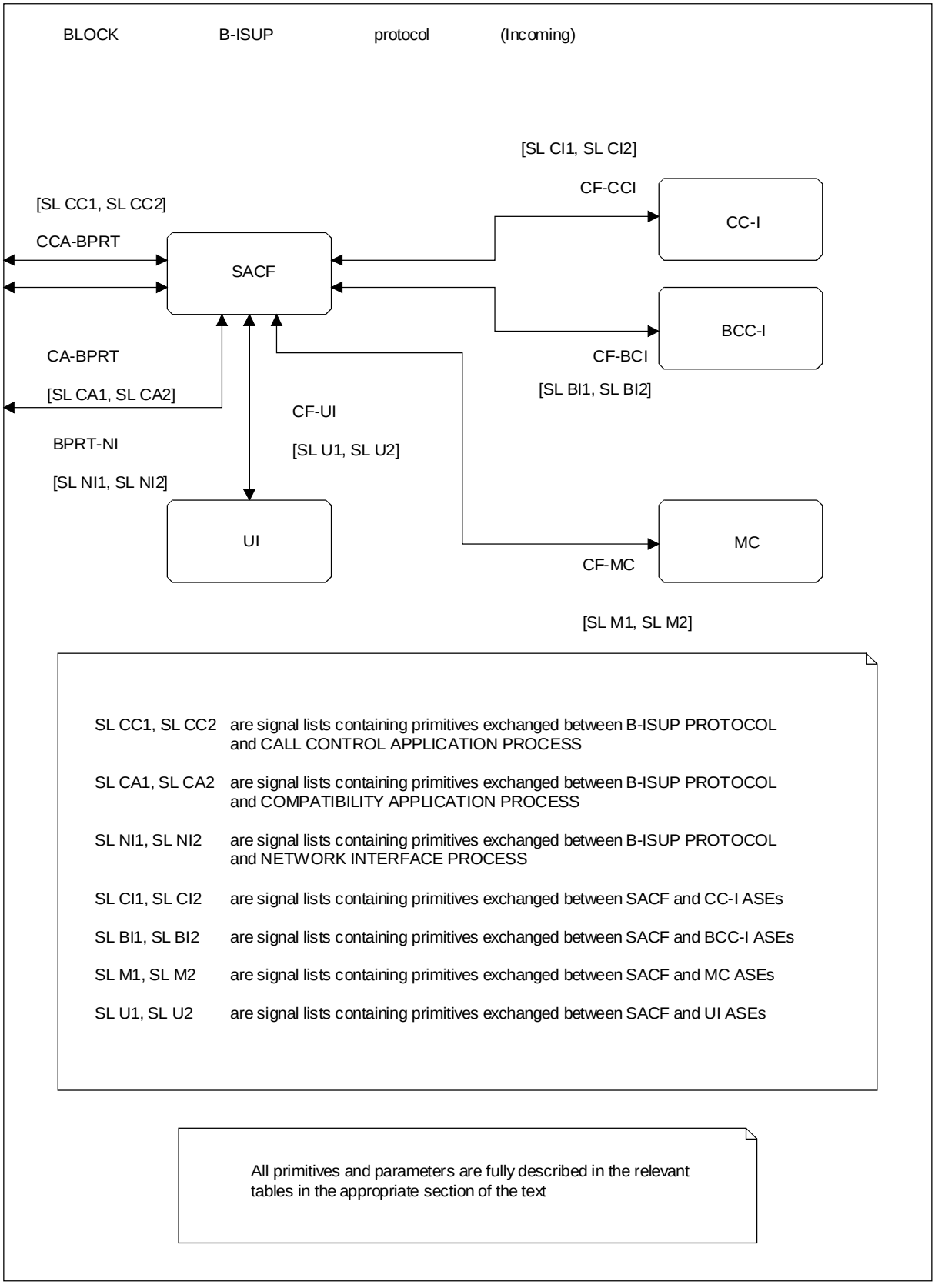


FIGURE C.3/Q.2764

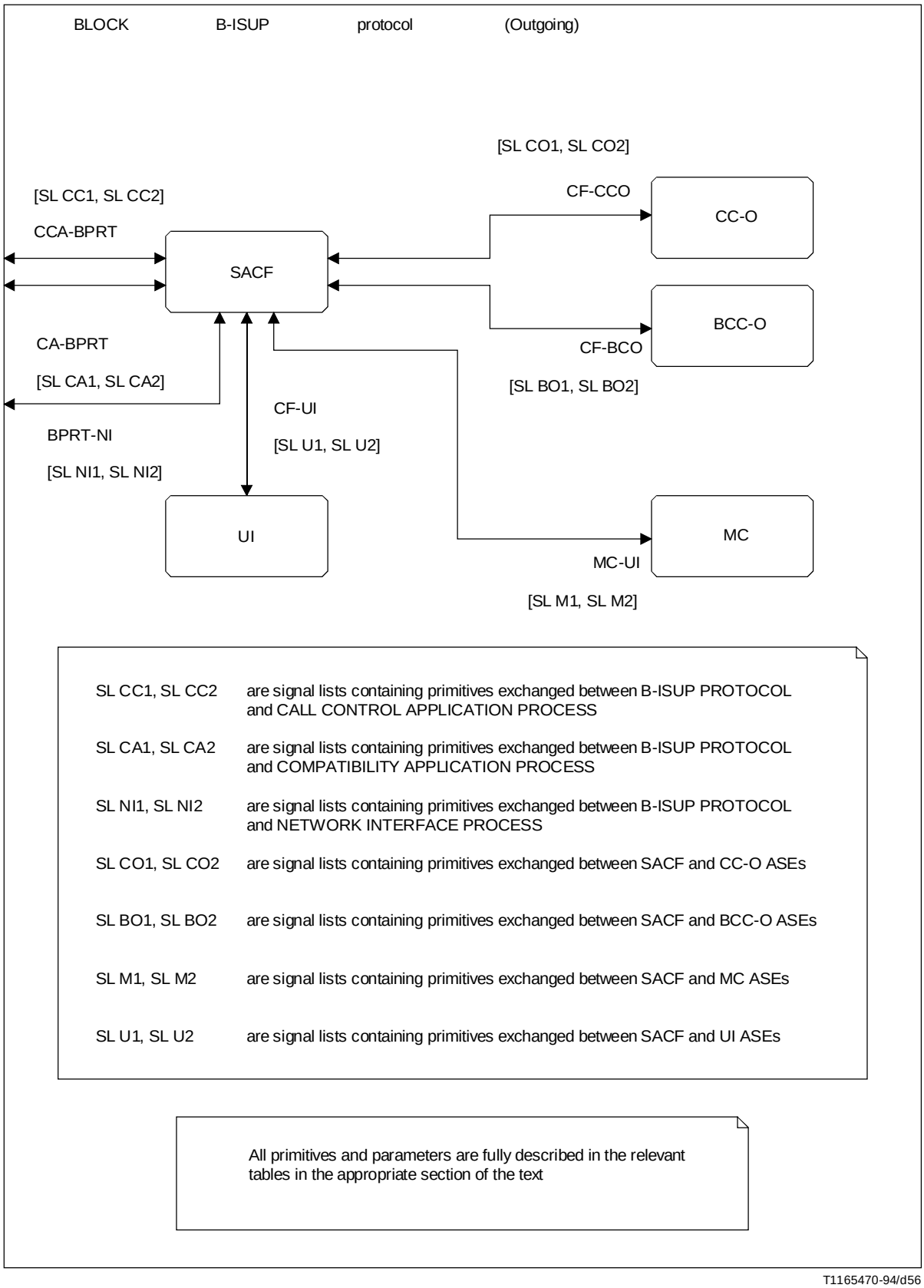


FIGURE C.4/Q.2764

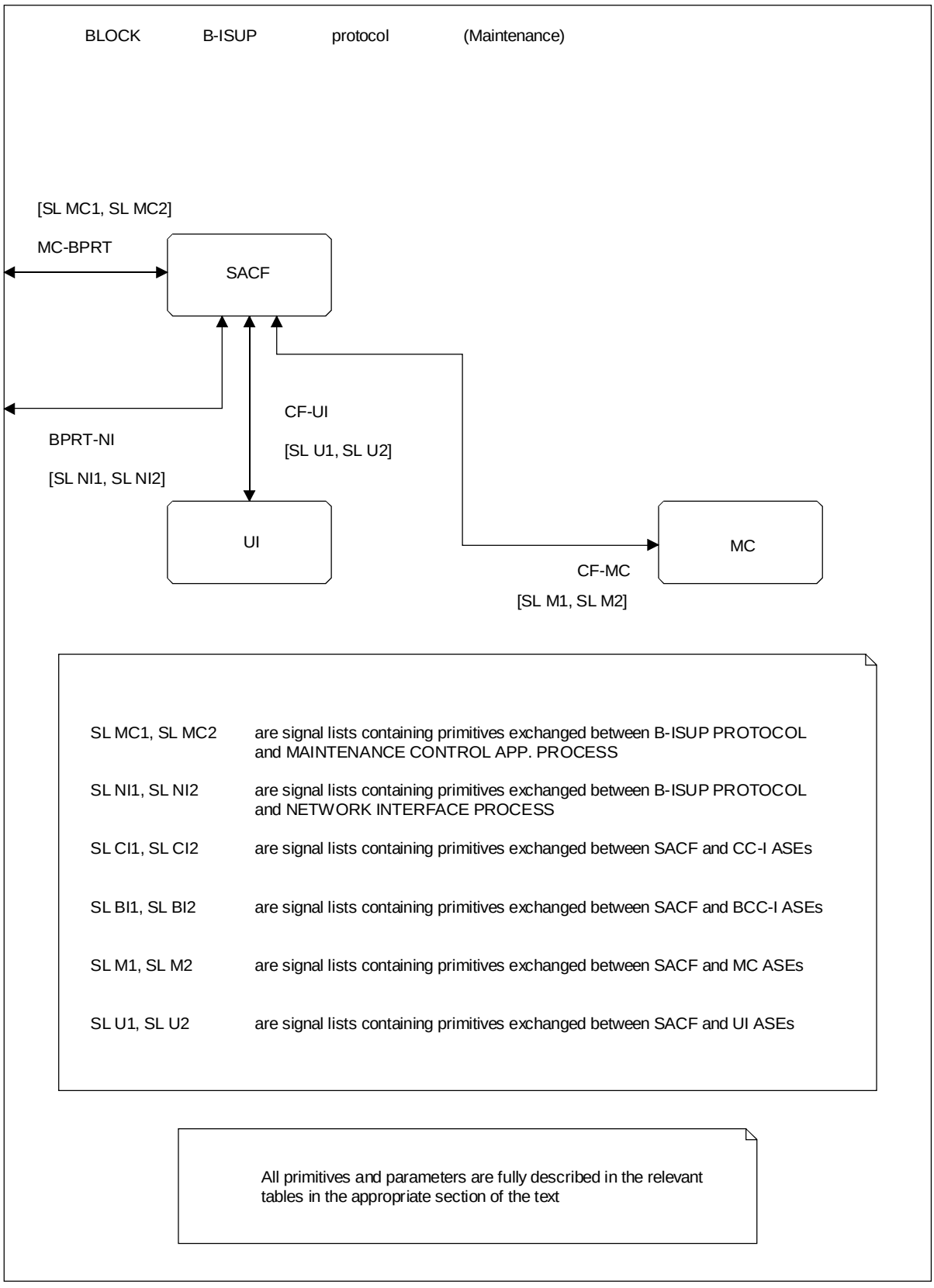


FIGURE C.5/Q.2764

Appendix I

Coding of the message compatibility information subfield

(This appendix does not form an integral part of this Recommendation)

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

TABLE I.1/Q.2764 *(end)*

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
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
Network resource management	Pass on	Discard message	Do not discard message	Do not send notification	Do not release call	End node 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	Pass on	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	Pass on	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
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.

Superseded by a more recent version

Appendix II

Coding of the parameter compatibility information subfield

(This appendix does not form an integral part of this Recommendation)

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
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
ATM cell rate	Default	Default	Default	Default	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
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
Broadband bearer capability	Default	Default	Default	Default	Release call	End node interpretation	Release call
Broadband 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
Broadband 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
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
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

TABLE II.1/Q.2764 *(end)*

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
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
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
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
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
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
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
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
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
Propagation delay counter	Default	Default	Default	Default	Release call	End node interpretation	Release call
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
Default = 0 value for the subfield.							