3GPP TSG CN Plenary Meeting #16 **NP-020207**
5th - 7th June 2002. Marco Island, USA.

Source:	**CN2**
Title:	**TS 23.278 v2.0.0**
Agenda item:	**8.1**
Document for:	**APPROVAL**

3GPP TSG CN WG2 Meeting #24 **Tdoc N2-020628**
Budapest, Hungary, 13th – 17th May 2002

Source:	**Lucent**
Title:	**TS 23.278 v2.0.0**
Agenda item:	**9.2**
Document for:	**INFORMATION / APPROVAL**

Introduction:

Attached is the draft version of TS 23.278 v2.0.0 for submission to CN#16 for approval.
This document defines the stage 2 specification for CAMEL/IMS interworking.

Outstanding issues:

- **The MRFC interface for playing tone/announcements and collection of digits is still an open issue. It has been decided that a SIP-based interfaced will be used between the MRFC and the Application Servers via S-CSCF, and that the SIP INVITE method will be used to establish the connection. However, the details on how the tone/announcements will be played has not been standardized yet. CN1(?) decision on the MRFC interface will impact CN2 stage 2 specification.**
- **Additional mapping of SIP messages to CAMEL DPs may be needed.**
- **Additional mapping of SIP-ISUP mapping for cause reasons may be needed.**

Note that there are open items that did not get resolved due to lack of time at CN2 meetings (CRs were submitted but postponed for next CN2 meeting). This includes modifications to SDL procedures related to mobile terminations for unregistered subscriber, additional stage 2 Information Flow descriptions, and other miscellaneous revisions e.g. additional references, acronyms and definitions, etc.

3GPP TS 23.278 V2.0.0 (2002-05)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Core Network; Customised Applications for Mobile network Enhanced Logic; (CAMEL) Phase 4 - Stage 2 IM CN Interworking (Release 5)

Keywords
UMTS, GSM, CAMEL, Stage 2, Network, IM CN Subsystem

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The present document specifies the stage 2 description for the third phase (see 3GPP TS 22.078 [2]) of the Customized Applications for Mobile network Enhanced Logic (CAMEL) feature within the 3GPP system.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the stage 2 description for the Customized Applications for Mobile network Enhanced Logic (CAMEL) feature which provides the mechanisms to support services of for the IP Multimedia Core Network (IM CN) Subsystem.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TR 21.905: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.078: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Customised Applications for Mobile network Enhanced Logic (CAMEL);Service description, Stage 1".

[3] 3GPP TS 22.228: "3rd Generation Partnership Project; Technical Specification Group Systems Aspects; IP Multimedia (IM) Subsystem –Stage 1.

[4] 3GPP TS 23.228: "3rd Generation Partnership Project; Technical Specification Group Systems Aspects; IP Multimedia (IM) Subsystem –Stage 1.

[5] 3GPP TS 23.218: "3rd Generation Partnership Project; Technical Specification Group Core Networks; IP Multimedia (IM) Session Handling; IP Multimedia Call Model.

[6] 3GPP TS 24.228: "3rd Generation Partnership Project; Technical Specification Group Core Networks; Signalling flows for the IP multimedia call control based on SIP and SDP.

[7] 3GPP TS 29.002: "3rd Generation Partnership Project; Technical Specification Group Core Network; Mobile Application Part (MAP) specification".

[8] 3GPP TS 29.078: "3rd Generation Partnership Project; Technical Specification Group Core Network; Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 3 CAMEL Application Part (CAP) specification".

3 Definitions and abbreviations

3.1 Definitions

IP Multimedia Core Network Service Switching Function (imcnSSF): functional entity that interfaces the IM-SSF to the gsmSCF. The concept of the imcnSSF is derived from the IN SSF, but uses different triggering mechanisms because of the nature of the mobile network.

IP Multimedia SSF (IM-SSF)

3.2 Abbreviations

Abbreviations used in the present document are listed in 3GPP TR 21.905 [1].

For the purposes of the present document, the following abbreviations apply:

BCSM	Basic Call State Model
CAMEL	Customized Applications for Mobile network Enhanced Logic
CAP	CAMEL Application Part
CSCF	Call State Control Function
DP	Detection Point
EDP	Event Detection Point
FTN	Forwarded To Number
GPRS	General Packet Radio Service
gsmSCF	GSM Service Control Function
gsmSRF	GSM Specialised Resource Function
gsmSSF	GSM Service Switching Function
HPLMN	Home PLMN
HSS	Home Subscriber Server
IE	Information Element
IF	Information Flow
IP	Internet Protocol
ISC	IM-CN Service Control
I-CSCF	Interrogating CSCF
IM	IP Multimedia
IM-BCSM	IP Multimedia Basic Call State Model
IMCN	IP Multimedia Core Network
imcnSSF	IM CN Service Switching Function
IM-CSI	IP Multimedia CAMEL Subscription Information
IM-SSF	IP Multimedia Service Switching Function
IPLMN	Interrogating PLMN
MGCF	Media Gateway Control Function
MO	Mobile Originating
MT	Mobile Terminating
NNI	Network Node Interface
O-IM-BCSM	Originating IP Multimedia Basic Call State Model
O-IM-CSI	Originating IP Multimedia CAMEL Subscription Information
PIC	Point In Call
PLMN	Public Land Mobile Network
P-CSCF	Proxy CSCF
SIP	Session Initiation Protocol
S-CSCF	Serving CSCF
T-IM-BCSM	Terminating IP Multimedia Basic Call State Model
VT-IM-CSI	Terminating IP Multimedia CAMEL Subscription Information
TDP	Trigger Detection Point
UNI	User Network Interface
VPLMN	Visited PLMN

4 CAMEL/IP Multimedia Core Network Interworking

4.1 Architecture

This subclause describes the functional architecture needed to support CAMEL interactions with the S-CSCF in the IP Multimedia Subsystem. The IM-SSF is a SIP Application Server that interfaces SIP to CAP. The generic SIP Application Server behaviour of the IM-SSF is specified in TS 23.218[5].

4.1.1 Functional Entities used for CAMEL at IP Multimedia Registration

Figure 4.1 shows the functional entities involved when an MS registers for IP Multimedia session requiring CAMEL support.

Subscriber data is transferred from the HSS to the CSCF during the SIP Registration. The subscriber data includes CAMEL related information.

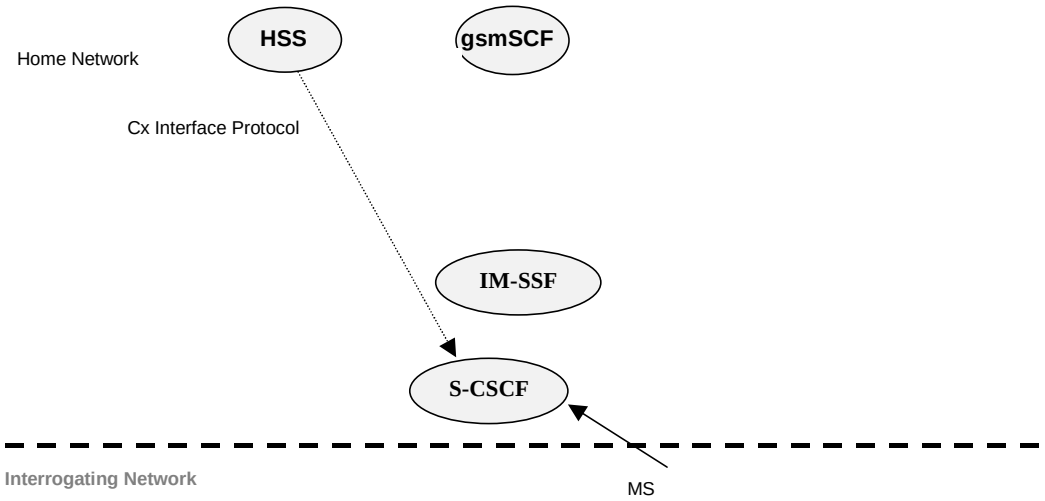

Figure 4.1: Functional architecture for support of CAMEL when mobile registers for IP Multimedia session

4.1.2 Functional Entities used for CAMEL for MO and MT IP Multimedia session

Figure 11.2 shows the functional entities involved in a Mobile Originated IP Multimedia session requiring CAMEL support.

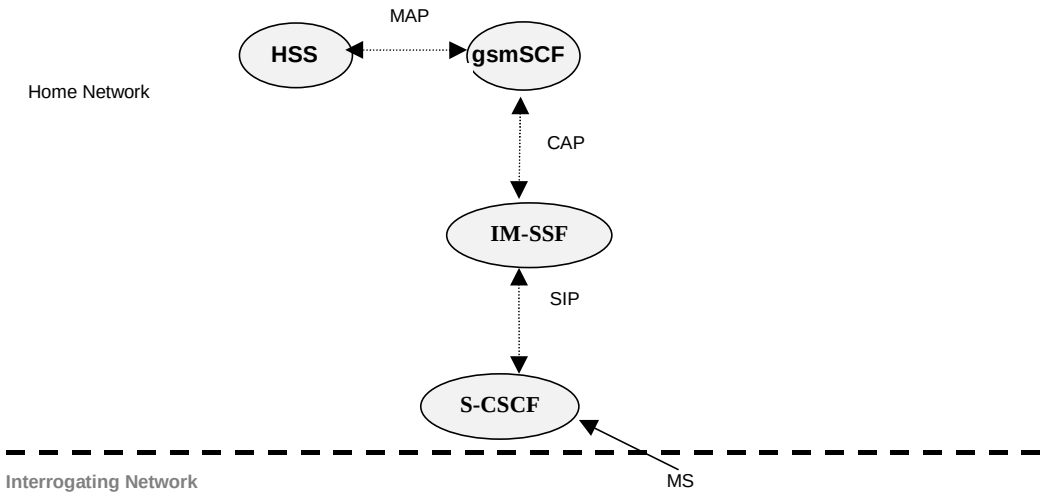

Figure 4.2: Functional architecture for support of CAMEL control of a MO IP Multimedia session

4.2 Interfaces defined for an IM-SSF based Application Server

4.2.1 CSCF – IM-SSF interface

This interface is the IP Multimedia Service Control interface (ISC). This interface shall be based on SIP as detailed in 3GPP TS 23.228 [4].

4.2.2 IM-SSF - gsmSCF interface

This interface is used by the gsmSCF to control an IP Multimedia session in a certain IM-SSF. Relationships between the IM-SSF and the gsmSCF on this interface are opened as a result of the IM-SSF sending a request for instructions to the gsmSCF. This interface shall be based on 3GPP TS 29.078[8].

4.2.3 HSS – CSCF interface

This interface is used to send CAMEL related subscriber data to a CSCF, e.g. IM-CSI.

4.3 Detection Points (DPs)

Certain basic call events may be visible to the GSM Service Control Function (gsmSCF). The DPs are the points in call at which these events are detected.

A DP can be armed in order to notify the gsmSCF that the DP was encountered, and potentially to allow the gsmSCF to influence subsequent handling of the call. If the DP is not armed, the processing entity continues the processing without gsmSCF involvement.

Three different types of DPs are identified:

- Trigger Detection Point - Request (TDP-R).

  This detection point is statically armed and initiates a CAMEL control relationship when encountered and there is no existing relationship due to the same CSI. Processing is suspended when the DP is encountered.

- Event Detection Point - Request (EDP-R).

  This detection point is dynamically armed within the context of a CAMEL control relationship. Processing is suspended when encountering the DP and the imcnSSF waits for instructions from the gsmSCF.

- Event Detection Point - Notification (EDP-N).

  This detection point is dynamically armed within the context of a CAMEL control relationship. Processing is not suspended when encountering the DP.

The DPs are characterized in the following clauses.

4.3.1 Arming/Disarming mechanism

A DP may be statically armed or dynamically armed.

The following arming rules apply:

- DPs for a mobile originating call handling is statically armed in the IM-SSF as a result of O-IM-CSI and D-IM-CSI data delivery from the HSS. Likewise, DPs for mobile terminating call handling is statically armed in the IM-SSF as a result of VT-IM-CSI data delivery from the HSS. Static arming of DPs in the IM-SSF occurs during the UE's registration in the IMS CN. Basically, when the IM-SSF is notified of the UE's initial registration, the IM-SSF queries the HSS for the subscriber's CAMEL Subscription Information via the Si interface.

- A DP is dynamically armed by the gsmSCF within the context of a CAMEL control relationship (between the imcnSSF and the gsmSCF).

The following disarming rules apply:

- A statically armed DP is disarmed when the IP Multimedia CSI data is withdrawn in the HSS/HLR. Only TDP-Rs can be disarmed using this mechanism.
- If an armed EDP is met, then it is disarmed.
- If an EDP is met that causes the release of the related leg, then all EDPs related to that leg are disarmed.
- If a call session is released, then all EDPs related to that call session are disarmed.
- If an EDP is met, then other EDPS are disarmed, in accordance with the implicit disarming rule table specified in TS 23.078 (refer to the section for “Rules for Implicit Disarming of Event Detection Points’).

If an EDP is armed, it can be explicitly disarmed by the gsmSCF by means of the RequestReportBCSMEvent information flow.

4.3.2 Criteria

Criteria are the conditions that must be met in order for the imcnSSF to request instructions from the gsmSCF.

DP criteria are checked in the IM-SSF. Criteria for originating DPs (i.e. Collected_Info, Analysed_Information, and Route_Select_Failure TDPs) are checked in the IM-SSF associated with the originating UE’s S-CSCF. Criteria for terminating DPs (i.e. T_Busy and T_No_Answer) are checked in the IM-SSF associated with the terminating UE’s S-CSCF.

Based on the Initial Filter Criteria information, the S-CSCF forwards the SIP message to the IM-SSF. The DP encountered is identified based on the SIP message received from the S-CSCF. Refer to Table 4.3 and Table 4.4 for mapping of SIP messages to CAMEL IM-BCSM Detection Points.

4.3.2.1 Criteria at Collected_Info

The following criteria are applicable for DP Collected_Info:

- Destination number triggering criterion: The HLR may store a list of up to 10 destination numbers and/or up to 3 number lengths. There is no restriction on the nature of address. There is no restriction on the numbering plan indicator. This criterion may be defined to be either "enabling" or "inhibiting".

Triggering at DP Collected_Info shall be strictly based on the destination number received from the S-CSCF.

The destination number received from the S-CSCF shall not be modified before conditional triggering check takes place.

If the destination number triggering criterion is enabling, then the imcnSSF may establish a dialogue with the gsmSCF if:

- the destination number matches one of the destination number strings defined in the list; or
- the length of the destination number matches one of the destination number lengths defined in the list.

In this test the destination number matches one of the destination number strings in the list if:

- the nature of address of destination number is the same as the nature of address of the destination number string;
- the destination number is at least as long as the destination number string in the list; and
- all the digits in the destination number string in the list match the leading digits of the destination number.

If the destination number triggering criterion is inhibiting, then the imcnSSF may establish a dialogue with the gsmSCF if:

- the destination number does not match any of the destination number strings defined in the list; and
- the length of the destination number does not match any of the destination number lengths defined in the list.

In this test the destination number matches one of the destination number strings in the list if:

- the nature of address of destination number is the same as the nature of address of the destination number string;
- the destination number is at least as long as the destination number string in the list; and
    - all the digits in the destination number string in the list match the leading digits of the destination number.

4.3.2.2 Criteria at DP Analysed_Information

4.3.2.2.1 General

The following criteria are applicable for DP Analysed_Information:

- Destination number triggering criterion: The HLR may store a list of up to 10 destination numbers. There is no restriction on the nature of address. There is no restriction on the numbering plan indicator.

For MO calls, triggering at DP Analysed_Info shall be based on the destination number received in the Connect operation from the gsmSCF during a Mobile Originating CAMEL Service.

4.3.2.2.2 Number comparison

The following procedure shall be performed for the comparison of the destination number triggering criterion and the address information in the given order.

1. The numbering plan indicators of both numbers are ignored.
2. The type of number/nature of address indicators of both numbers are compared. If there is a match of the type of number indicator, then the check shall be performed by comparing the digits as defined in step 6. If there is no match of the type of number the comparison procedure shall continue as follows.
3. If there are other type of number/nature of address indicators present than "unknown", "national (significant) number" or "international number" then the destination number does not match the destination number triggering criterion. Otherwise the comparison procedure shall continue as follows.
4. If there is a number with type of number/nature of address "unknown" this number shall be translated based on the numbering plan of the serving entity in either of the following ways:

    - if the leading digits refer to an international prefix, those digits shall be removed and the type of number/nature of address shall be set to "international number".
    - if the leading digits refer to a national (trunk) prefix, those digits shall be removed and the type of number/nature of address shall be set to "national (significant) number".

    If the leading digits refer neither to an international prefix nor to a national (trunk) prefix, then the destination number does not match the destination number triggering criterion.

    If there is a match of the type of number/nature of address indicator after this number modification, then the check shall be performed by comparing the digits as defined in step 6, otherwise the comparison procedure shall continue as follows.
5. If there is a number with type of number/nature of address "national (significant) number" this number shall be translated based on the numbering plan of the serving entity to international format by adding the country code of the serving entity to the number string. After this modification both numbers shall be in international format and shall be checked by comparing the digits as defined in step 6.

6 If the number digits of the address information are compared with the number digits of the destination number triggering criterion, then there is a match if:

- the destination number is at least as long as the destination number string of the destination number triggering criterion; and
- all the digits in the destination number string of the destination number triggering criterion match the leading digits of the destination number.

The check described in this clause shall be repeated for every number contained in the destination number triggering criterion of the D-IM-CSI until a match is recognised and DP Analysed_Info is triggered, or until all the destination numbers have been checked without a match being recognised. In the latter case DP Analysed_Info is not triggered.

4.3.2.3 Criteria at DP Route_Select_Failure

The HLR may store a list of up to 5 cause values.

The following criteria are applicable for DP Route_Select_Failure:

- Release cause code.

The trigger criteria is met if the cause code received from the terminating party's network (could be a PSTN or an IMS network) is equal to at least one of the cause codes in the trigger criteria list.

If a O-IM-BCSM was already invoked and there is a relationship with the gsmSCF at that moment, then no additional relationship shall be initiated.

4.3.2.4 Criteria at DP T_Busy and T_No_Answer

The HSS may store a list of up to 5 cause values.

The triggering is based on the release cause code received from terminating UE's P-CSCF.

The following criteria are applicable for DP T_Busy and T_No_Answer:

- Release cause code.

The trigger criteria are met if the cause code received from the terminating UE's P-CSCF is equal to at least one of the cause codes in the trigger criteria list.

If trigger criteria are satisfied, then the corresponding Service Logic shall be invoked.

4.4 Description of CAMEL Subscriber Data

4.4.1 IP Multimedia CAMEL Subscription Information (IM-CSI)

This subclause defines the contents of the IP Multimedia CAMEL Subscription Information. IM-CSI data are provisioned in the HSS for subscribers having originating and/or terminating IP Multimedia CAMEL services. This information shall be sent by the HSS to the IM-SSF via the Si Interface. The IM-CSI data contains the O-IM-CSI, D-IM-CSI, and VT-IM-CSI.

4.4.1.1 Originating IP Multimedia CAMEL Subscription Information (O-IM-CSI)

4.4.1.1.1 gsmSCF Address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routeing.

4.4.1.1.2 Service Key

The Service Key identifies to the gsmSCF the service logic that shall apply.

4.4.1.1.3 Default Call Handling

The Default Call Handling indicates whether the IP Multimedia session shall be released or continued as requested in case of error in the IM-SSF to gsmSCF dialogue.

4.4.1.1.4 TDP List

The TDP List indicates on which detection point triggering shall take place.

4.4.1.1.5 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service.

4.4.1.1.6 CSI Status

The CSI state indicates whether the O-IM-CSI is active or not.

4.4.1.1.7 Notification Flag

The notification flag indicates whether changes of the O-IM-CSI shall trigger the Notification on Change of Subscriber Data. In order to update the IM-SSF of IM CSI changes, this flag shall be set to yes.

4.4.1.1.8 DP Criteria

The DP criteria indicate whether the imcnSSF shall request the gsmSCF for instructions.

4.4.1.2 Dialled Services IP Multimedia CAMEL Subscription Information (D-IM-CSI)

4.4.1.2.1 gsmSCF Address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routeing.

4.4.1.2.2 Service Key

The Service Key identifies to the gsmSCF the service logic that shall apply.

4.4.1.2.3 Default Call Handling

The Default Call Handling indicates whether the IP Multimedia session shall be released or continued as requested in case of error in the IM-SSF to gsmSCF dialogue.

4.4.1.2.4 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service.

4.4.1.2.5 CSI Status

The CSI state indicates whether the D-IM-CSI is active or not.

4.4.1.2.6 Notification Flag

The notification flag indicates whether changes of the D-IM-CSI shall trigger the Notification on Change of Subscriber Data. In order to update the IM-SSF of IM CSI changes, this flag shall be set to yes.

4.4.1.2.7 DP Criteria

The DP criteria indicate whether the imcnSSF shall request the gsmSCF for instructions.

4.4.1.3 Terminating IP Multimedia CAMEL Subscription Information (VT-IM-CSI)

4.4.1.3.1 gsmSCF Address

Address to be used to access the gsmSCF for a particular subscriber. The address shall be an E.164 number to be used for routeing.

4.4.1.3.2 Service Key

The Service Key identifies to the gsmSCF the service logic that shall apply.

4.4.1.3.3 Default Call Handling

The Default Call Handling indicates whether the IP Multimedia session shall be released or continued as requested in case of error in the IM-SSF to gsmSCF dialogue.

4.4.1.3.4 TDP List

The TDP List indicates on which detection point triggering shall take place. The following trigger detection points are allowed: DP Terminating_Attempt_Authorised, DP T_Busy, and DP T_No_Answer.

4.4.1.3.5 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service.

4.4.1.3.6 CSI Status

The CSI state indicates whether the VT-IM-CSI is active or not.

4.4.1.3.7 Notification Flag

The notification flag indicates whether changes of the VT-IM-CSI shall trigger the Notification on Change of Subscriber Data. In order to update the IM-SSF of IM CSI changes, this flag shall be set to yes.

4.4.1.3.8 DP Criteria

The DP criteria indicate whether the imcnSSF shall request the gsmSCF for instructions.

4.4.1.4 Other CAMEL Data

4.4.1.4.1 gsmSCF address list for CSI

The gsmSCF address list for CSI indicates a list of gsmSCF addresses to which Notification on Change of Subscriber Data is to be sent. In order to provide Notification on Change of Subscriber Data to the IM-SSF, the IM-SSF address shall be included in the gsmSCF address list.

The IM-SSF address is added to the address list for notification in the HSS/HLR as described in subclause 5.1.1a.

The IM-SSF shall handle the receipt of the Notification on Change of Subscriber Data using the same procedure as that of a gsmSCF.

4.5 Description of CAMEL State Models

In the IM Subsystem, calls are controlled by the Serving CSCF (S-CSCF) where a subscriber is registered. A state model describes the call control behaviour of an IM-SSF.

4.5.1 General Handling

The Basic Call State Model (BCSM) is used to describe the handling of originating and terminating calls. It identifies the points in a call where gsmSCF based service applications is permitted to interact with the call control capabilities of an IM-SSF. Figure 4.3 illustrates how transitions between states, Detection Points and Points In Call components are shown in the BCSM diagrams.

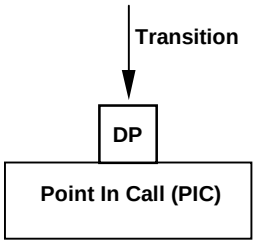

Figure 4.3: BCSM Components

4.5.2 Originating CAMEL Call State Model (O-IM-BCSM)

4.5.2.1 Description of the O-IM-BCSM

The O-IM-BCSM is used to model the behaviour of an IM-SSF for an originating call. When an armed DP is encountered, O-IM-BCSM processing is suspended at the DP and the IM-SSF indicates this to the gsmSCF if appropriate.

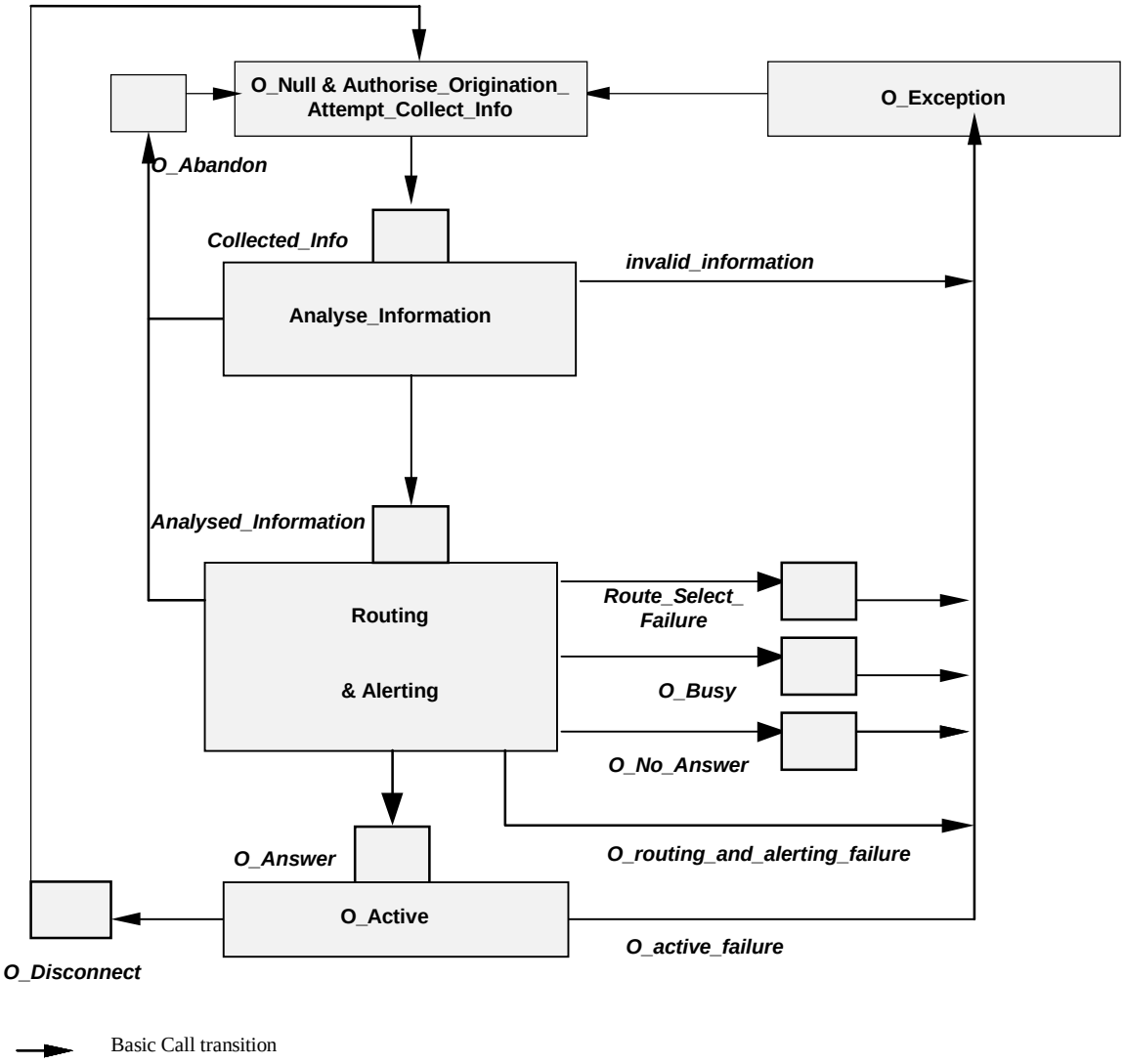

Figure 4.4: Originating CAMEL Basic Call State Model

The following table defines the DPs that apply to originating calls.

Table 4.1: Description of the O-IM-BCSM DPs in an IM-SSF

CAMEL Detection Point:	DP Type	Description:
DP Collected_Info	TDP-R	Indication that the O-IM-CSI is analysed
DP Analysed_Information	TDP-R	Availability of routeing address and nature of address.
DP Route_Select_Failure	TDP-R, EDP-N, EDP-R	Indication that the session establishment failed.
DP O_Busy	EDP-N, EDP-R	Indication that: - a busy indication is received from the terminating party, - a not reachable event is determined upon a SIP error response.
DP O_No_Answer	EDP-N, EDP-R	Indication that: - an application timer associated with the O_No_Answer DP expires, - a no answer event is determined upon SIP a error response
DP O_Answer	EDP-N, EDP-R	Indication that the session is accepted and answered by the terminating party.
DP O_Disconnect	EDP-N, EDP-R	A disconnect indication is received from the originating party or from the terminating party.
DP O_Abandon	EDP-N, EDP-R	Indication that a disconnect indication is received from the originating party during the session establishment procedure.

4.5.2.2 Description of Points In Call

This sub-clause describes the Points In Call for originating calls. The entry events, actions and exit events are described for each Point in Call.

4.5.2.2.1 O_Null & Authorise_Origination_Attempt_Collect_Info

Entry events:

- Disconnection and clearing of a previous call (DP O_Disconnect) or default handling of exceptions by IM-SSF completed.
- Abandon event is reported from Analyse_Information or Routing and Alerting PIC.
- Exception event is reported.

Actions:

- Interface is idled.
- Originating call: SIP INVITE request message containing the dialled number is received from MS.
- Information being analysed e.g., O-IM-CSI is analysed.

Exit events:

- Originating CSI is analysed.
- An exception condition is encountered. For this PIC, if the call encounters one of these exceptions during the PIC processing, the exception event is not visible because there is no corresponding DP. Example exception condition: Calling party abandons call.

4.5.2.2.2 Analyse_Information

Entry events:

- Originating CSI is analysed. (DP Collected Info).
- New routeing information is received when Busy event (DP O_Busy), Route Select Failure event (DP Route_Select_Failure), Not Reachable event (DP O_Busy) or No Answer event (DP O_No_Answer) is reported from Routing and Alerting PIC.
- New routeing information is received when Disconnect event is reported from O_Active PIC.

Actions:

- Compare the called party number with the dialled services information.

Exit events:

- Availability of routeing address and nature of address. (DP Analysed_Information).
- An exception condition is encountered (e.g. wrong number)- this leads to the O_Exception PIC.
- Calling party abandons the call- this leads to the O_Abandon DP.

4.5.2.2.3 Routing and Alerting

Entry events:

- Availability of routeing address and nature of address. (DP Analysed_Information).

Actions:

- Information is being analysed and/or translated according to dialling plan to determine routeing address.
- Routeing address being interpreted.
- Call is being processed by the terminating half BCSM. Continued processing of SIP call session setup (e.g., ringing) is taking place. Waiting for indication from terminating half BCSM that the call has been answered by terminating party.

Exit events:

- Indication from the terminating half BCSM that the call is accepted and answered by terminating party (DP O_Answer).
- An exception condition is encountered - this leads to the O_Exception PIC.
- Calling party abandons the call- this leads to the O_Abandon DP.
- A busy indication is received from the terminating party - this leads to the O_Busy DP.
- A not reachable indication is received from the terminating party - this leads to the O_Busy DP.
- Attempt to select the route for the call fails - this leads to the Route_Select_Failure DP.

If the no reply timer expires and DP O_No_Answer is armed - this leads to the O_No_Answer DP.

4.5.2.2.4 O_Active

Entry events:

- Indication from the terminating half BCSM that the call is accepted and answered by the terminating party (DP O_Answer).

Actions:

- SIP session established between originating party and terminating party. - Call release is awaited.

Exit events:

- A disconnection indication is received from the originating party, or received from the terminating party via the terminating half BCSM. (DP - O_Disconnect).

- An exception condition is encountered.

4.5.2.2.5 O_Exception

Entry events:

- An exception condition is encountered. In addition to specific examples listed above, exception events include any type of failure, which means that the normal exit events for a PIC can not be met.

Actions:

- Default handling of the exception condition is being provided. This includes general actions necessary to ensure that no resources remain inappropriately allocated such as:

  - If any relationship exists between the imcnSSF and the gsmSCF, the imcnSSF shall send an error information flow closing the relationships and indicating that any outstanding call handling instructions will not run to completion.

  - Resources made available for setting up the SIP call session are released.

Exit events:

- Default handling of the exception condition by IM-SSF completed.

4.5.3 Mapping of SIP Method/Response to O-IM-BCSM Detection Points

This sub-clause describes mapping of SIP methods and responses to CAMEL Detection Points.

Table 4.2: Mapping of SIP Method/Response to CAMEL O-IM-BCSM DPs

CAMEL O-IM-BCSM DP:	SIP Method/Response
DP Collected_Info	INVITE
DP Analysed_Information	N/A
DP Route_Select_Failure	404 Not Found 482 Loop Detected 483 Too Many Hops
DP O_Busy	486 Busy Here 600 Busy Everywhere
DP O_No_Answer	603 Decline 408 Request Timeout
DP O_Answer	200 OK
DP O_Disconnect	BYE
DP O_Abandon	CANCEL

Additional mapping of SIP responses to CAMEL DP requires further study.

4.5.4 Terminating CAMEL Call State Model (T-IM-BCSM)

4.5.4.1 Description of the T-IM-BCSM

The T-IM-BCSM is used to model the behaviour of an IM-SSF for a terminating call. When a DP is encountered, T-IM-BCSM processing is suspended at the DP and IM-SSF indicates this to the gsmSCF if appropriate.

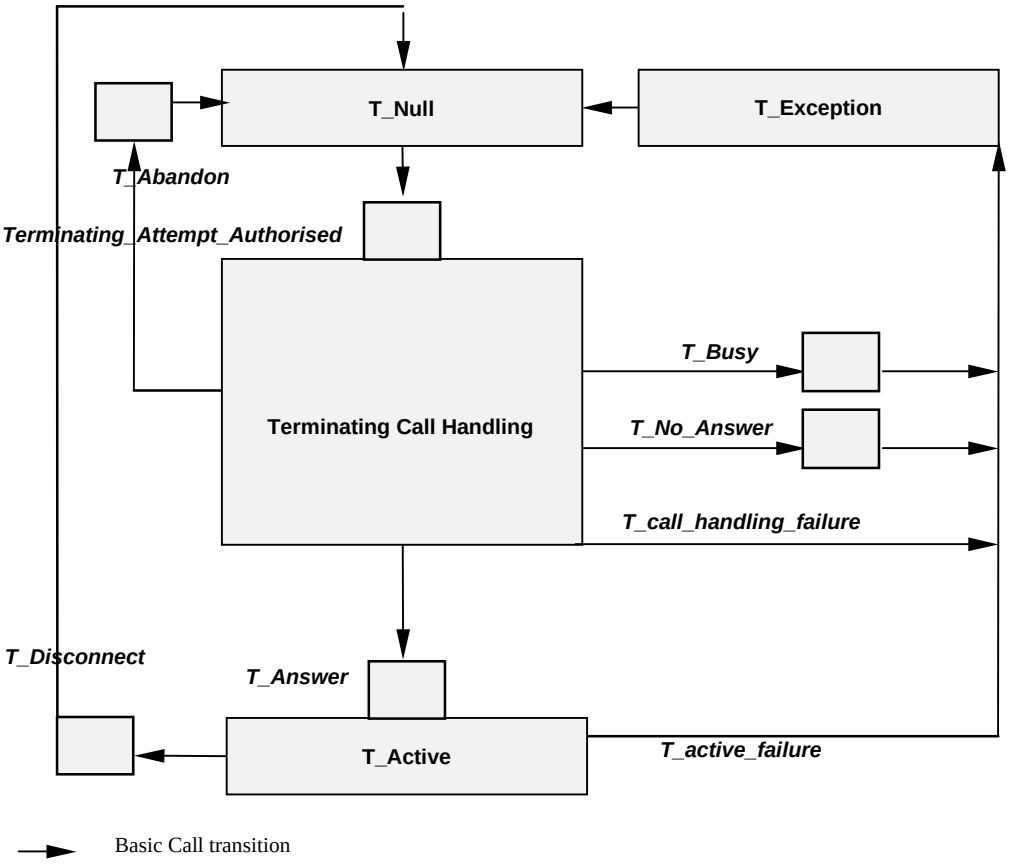

Figure 4.5: Terminating CAMEL Basic Call State Model

The following table defines the DPs that apply to terminating calls.

Table 4.3: Description of T-IM-BCSM DPs in the S-CSCF

CAMEL DP:	DP Type	Description:
DP Terminating_Attempt_ _Authorised	TDP-R	Indication that the VT-IM-CSI is analysed.
DP T_Busy	TDP-R, EDP-N, EDP-R	Indication that: - a busy indication is received from the terminating party, - a not reachable event is determined upon a SIP error response.
DP T_No_Answer	TDP-R, EDP-N, EDP-R	Indication that an application timer associated with the T_No_Answer DP expires.
DP T_Answer	EDP-N, EDP-R	Session is accepted and answered by terminating party.
DP T_Disconnect	EDP-N, EDP-R	A disconnect indication is received from the terminating party or from the originating party.
DP T_Abandon	EDP-N, EDP-R	A disconnect indication is received from the originating party during the session establishment procedure.

4.5.4.2 Description of Points In Call

This sub-clause describes the Points In Call for terminating calls. The entry events, actions and exit events are described for each Point in Call.

4.5.4.2.1 T_Null

Entry events:

- Disconnection and clearing of a previous call (DP T_Disconnect) or default handling of exceptions by IM-SSF completed.
- Abandon event is reported from Terminating Call Handling PIC.
- Exception event is reported.

Actions:

- Interface is idled.
- SIP INVITE message for terminating call request is received, the appropriate information is analysed.
- VT-IM-CSI is analysed.

Exit events:

- Terminating CSI is analysed.
- An exception condition is encountered. For this PIC, if the call encounters one of these exceptions during the PIC processing, the exception event is not visible because there is no corresponding DP.

  Example exception condition is:

- Calling party abandons call.

4.5.4.2.2 Terminating Call Handling

Entry events:

- Terminating CSI (if available) is analysed. (DP Terminating_Attempt_Authorised).

- New routeing information is received when Busy event (DP T_Busy) or No Answer event (DP T_No_Answer) is reported from Terminating Call Handling PIC.
- New routeing information is received when Disconnect event is reported from T_Active PIC.
- New routeing information is received when the terminating party not reachable is reported from Terminating Call Handling PIC.

Actions:

- - Routeing address and call type being interpreted. The next route or terminating access is being selected.
- The terminating party is being alerted. Waiting for the call to be answered by terminating party.

Exit events:

- Call is accepted and answered by terminating party.
- An exception condition is encountered - this leads to the T_Exception PIC. Example exception conditions: the SIP call session request was not successful.
- Calling party abandons the call - this leads to the T_Abandon DP.
- A busy indication is received from the terminating party's P-CSCF - this leads to the T_Busy DP.
- Not reachable event detected from the terminating party's P-CSCF this leads to the T_Busy DP.

- If no reply timer expires and DP T_No_Answer is armed - this leads to the T_No_Answer DP.

4.5.4.2.3 T_Active

Entry events:

- Indication that the call is accepted and answered by the terminating party. (DP T_Answer).

Actions:

- SIP session established between originating party and terminating party.
- Call release is awaited.

Exit events:

- A disconnection indication is received from the terminating party, or received from the originating party via the originating half BCSM. (DP T_Disconnect).
- An exception condition is encountered. In addition to specific examples listed above, exception events include any type of failure that means that the normal exit events for a PIC can not be met.

4.5.4.2.4 T_Exception

Entry events:

- An exception condition is encountered. In addition to specific examples listed above, exception events include any type of failure, which means that the normal exit events for PIC cannot be met.

Actions:

- Default handling of the exception condition is being provided. This includes general actions necessary to ensure that no resources remain inappropriately allocated such as:
  - If any relationship exists between the imcnSSF and the gsmSCF, the imcnSSF shall send an error information flow closing the relationships and indicating that any outstanding call handling instructions will not run to completion.
  - . Resources made available for setting up the SIP call session are released.

Exit events:

- Default handling of the exception condition by IM-SSF completed.

4.5.5 Mapping of SIP Method/Response to T-IM-BCSM Detection Points

This sub-clause describes mapping of SIP methods and responses to CAMEL Detection Points.

Table 4.4: Mapping of SIP Method/Response to CAMEL T-IM-BCSM DPs

CAMEL T-IM-BCSM DP:	**SIP Method/Response**
DP Terminating_Attempt_ _Authorised	INVITE
DP T_Busy	486 Busy Here 600 Busy Everywhere
DP T_No_Answer	603 Decline 408 Request Timeout
DP T_Answer	200 OK
DP T_Disconnect	BYE
DP T_Abandon	CANCEL

Additional mapping of SIP responses to CAMEL DP requires further study.

5 Procedures for IM-SSF Application Server

The SDLs in this specification illustrate how CAMEL modifies the normal multimedia call. They do not attempt to show all the details of multimedia handling in all the modes that support CAMEL.

The text in this clause is a supplement to the definition in the SDL diagrams; it does not duplicate the information in the SDL diagrams.

5.1 Overall SDL Architecture

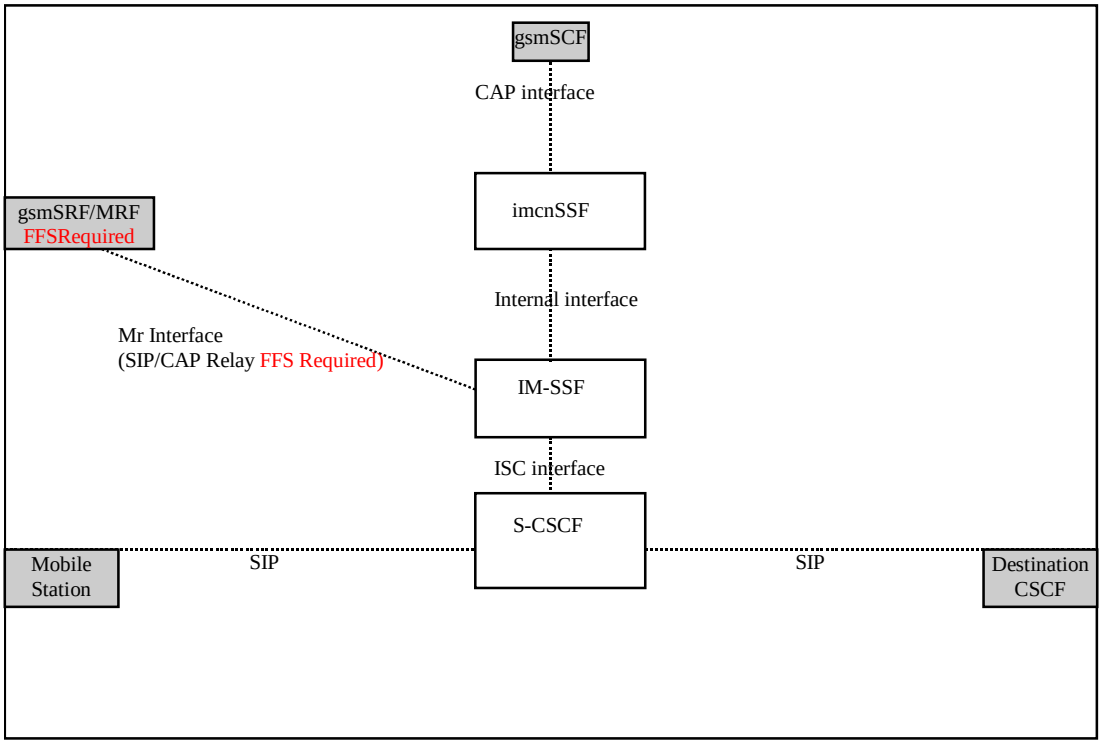

Figure 5.1: Outgoing Case (IM-SSF relay)

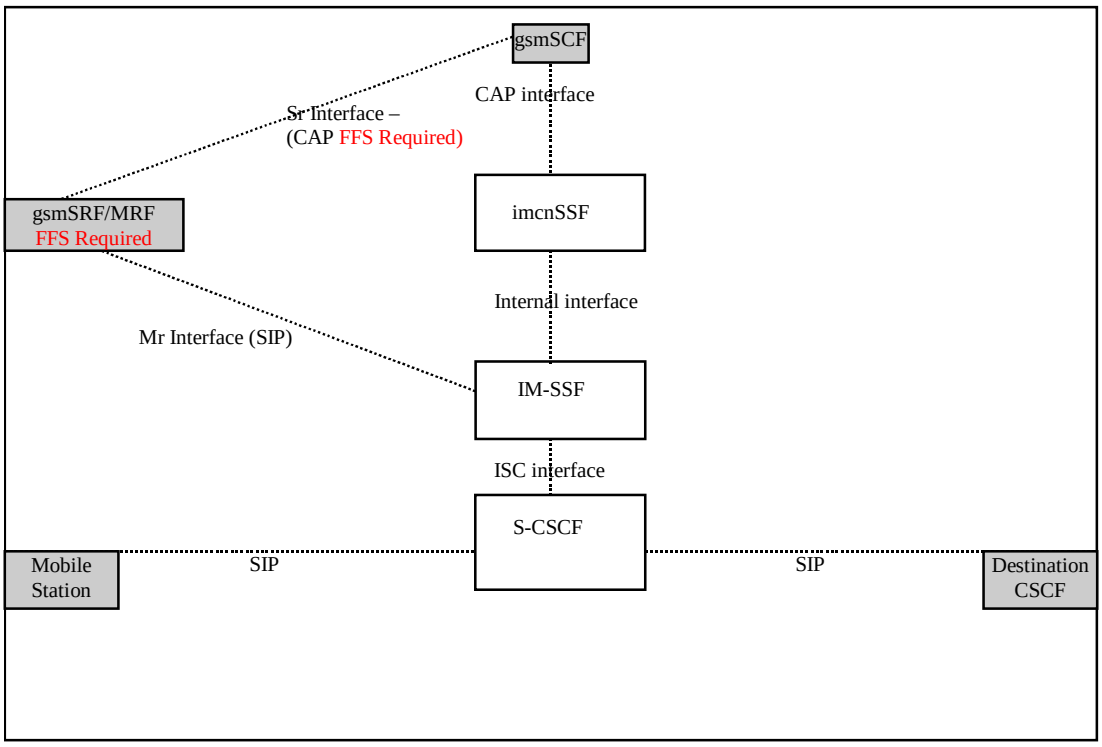

Figure 5.2: Outgoing Case (direct path gsmSCF to gsmSRF/MRCF)

5.1.1 Handling of Registration and De-registration in the IM-SSF

During the UE registration, the HSS shall send the filter criteria for the IM-SSF to the S-CSCF if the subscriber is provisioned with IP Multimedia CAMEL Subscription Information data at the HSS.

– The HSS shall include the IMSI data for the subscriber within the Service Information element of the filter criteria for IM-SSF. The IMSI shall be used for querying the HSS/HLR for CAMEL Subscription Information data via a MAP interface.

The CAMEL service provider determines the actual format of the data sent within the Service Information element of the filter criteria (e.g. IMSI). The actual format is transparent to the S-CSCF i.e. CAMEL service information is not processed, analysed, or evaluated by the S-CSCF. It is, however, known to the IM-SSF, gsmSCF, and the HSS (for provisioning of the service information data).

If a registration/de-registration request matches the filter criteria of the IM-SSF, the S-CSCF informs the IM-SSF of the request by performing a third party registration/de-registration i.e. a SIP REGISTER message is sent from the S-CSCF to the IM-SSF.

General handling of IP Multimedia registration, re-registration, de-registration and receipt of initial filter criteria at the S-CSCF is specified in TS 23.228 and 23.218.

The procedures specific to CAMEL are specified in this subclause:

- Procedure CAMEL_IMCN_Register_Init
- Procedure CAMEL_IMCN_Register;
- Procedure CAMEL_IMCN_DeRegister.

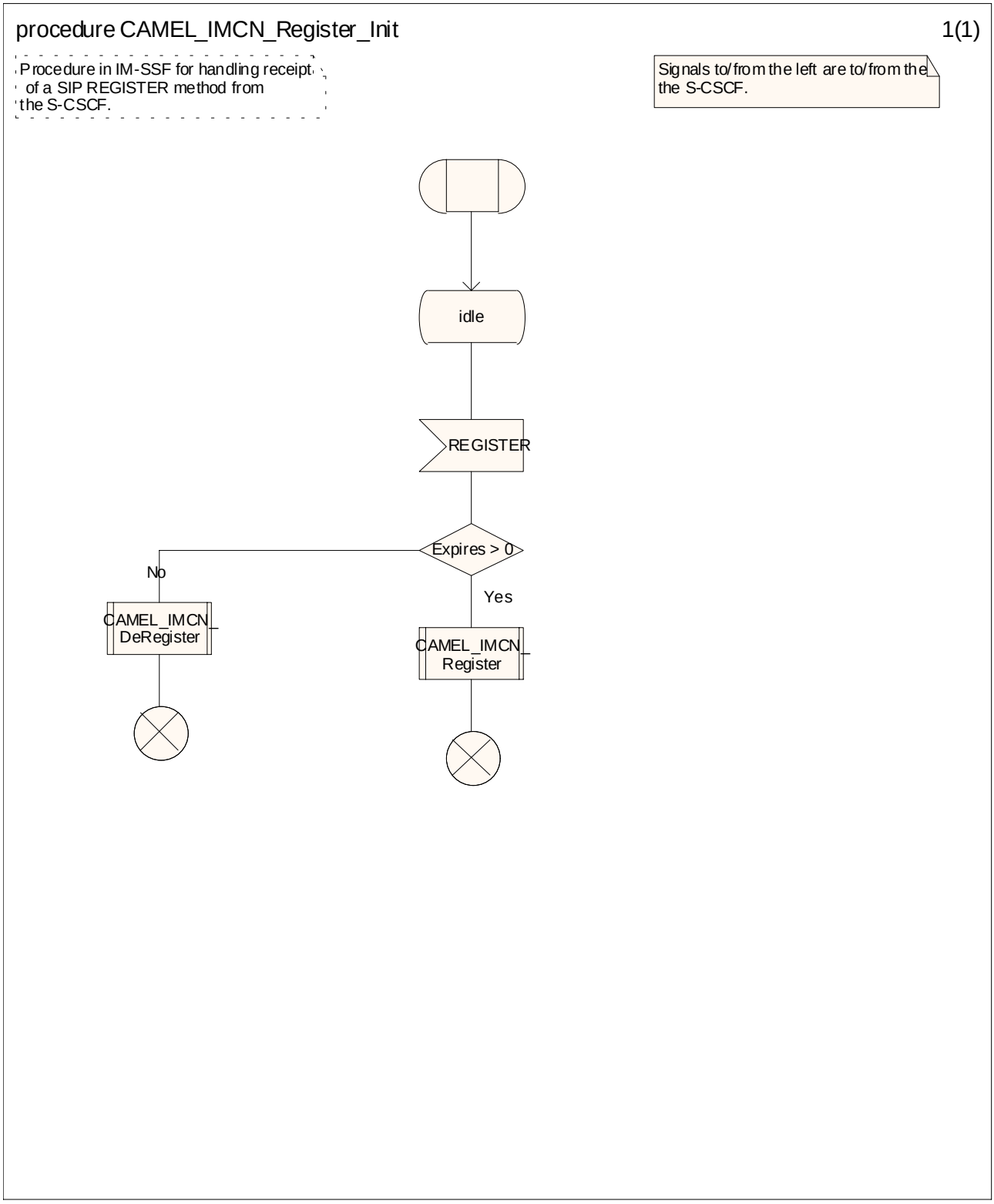

Figure 5.3a: Procedure CAMEL_IMCN_Register_Init (sheet 1)

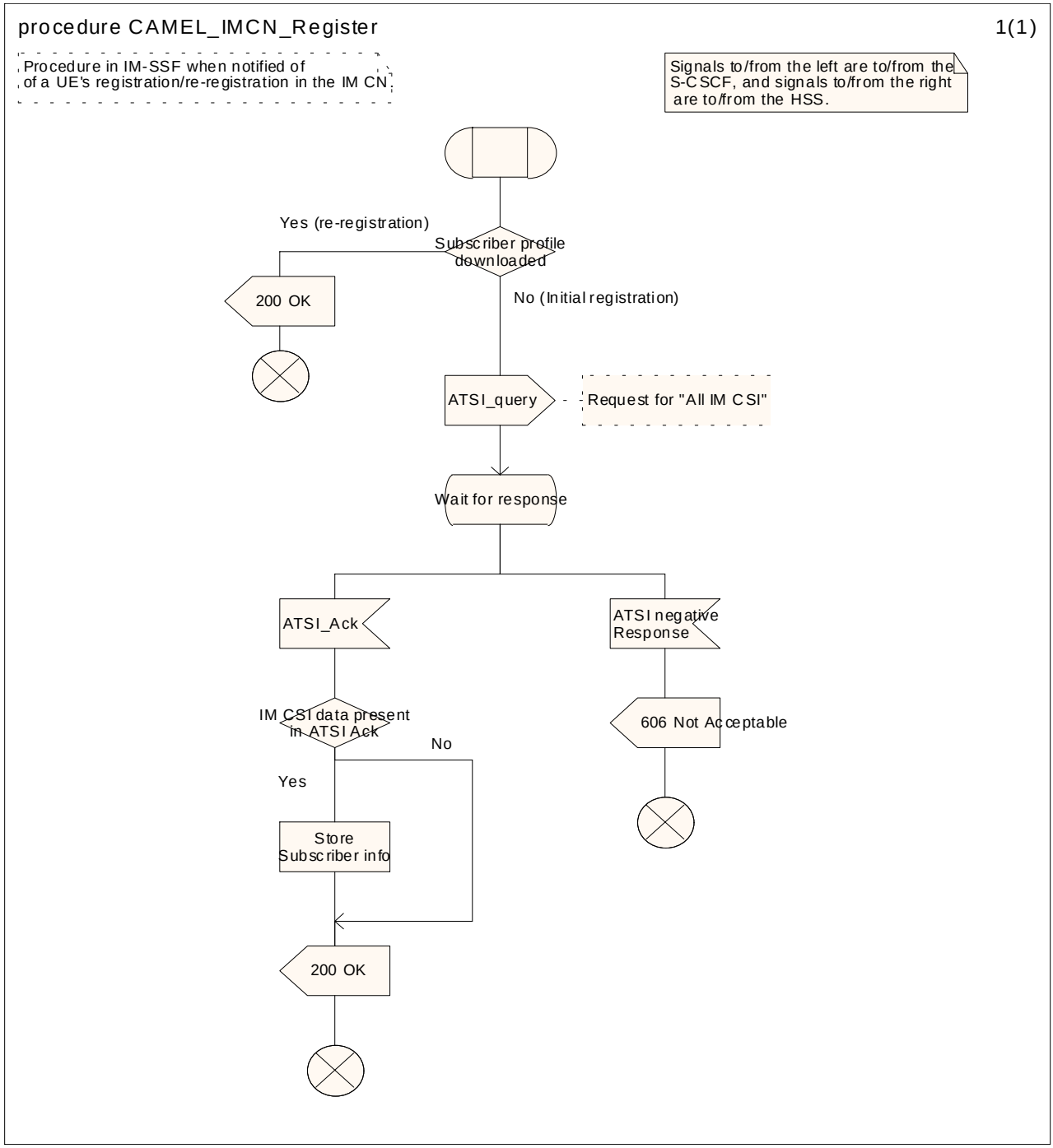

Figure 5.4a: Procedure CAMEL_IMCN_Register (sheet 1)

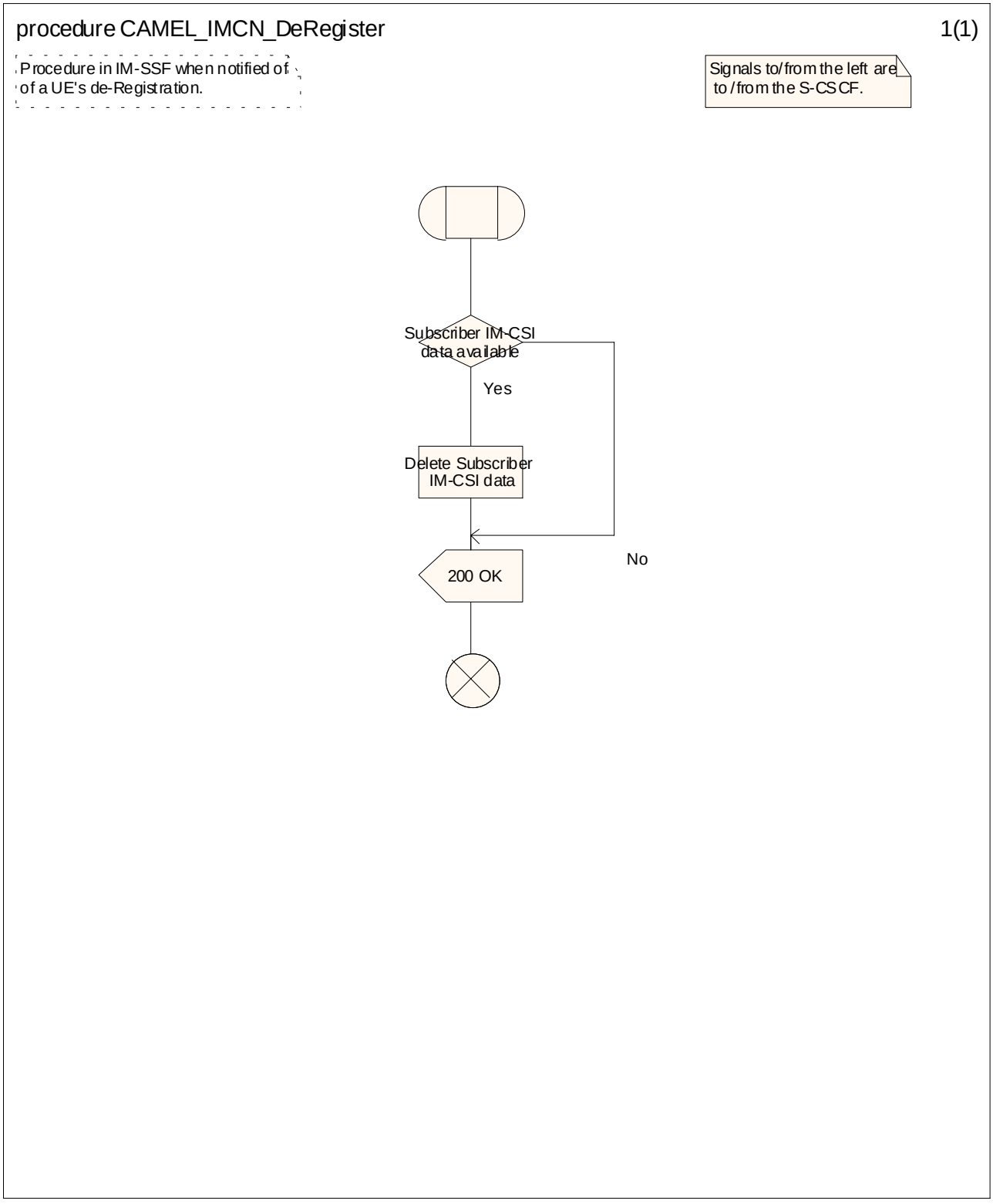

Figure 5.5a: Procedure CAMEL_IMCN_DeRegister (sheet 1)

5.1.1a Handling of Notify Subscriber Data Change

When the HSS/HLR updates the CSI for a subscriber in the IP Multimedia CN subsystem, the HSS/HLR shall send a Notify Subscriber Data Change to the IM-SSF if all of the following conditions are true:

- The IM CSI data is marked with the Notification Flag
- The IM-SSF address is included in the gsmSCF address list

The IM-SSF address shall be added in the gsmSCF address list at the HSS/HLR for notification of IM-CSI updates if one of the following conditions occurs:

a. The HSS/HLR is notified of the subscriber's registration at the S-CSCF (via Cx interface), and the subscriber is provisioned with IM CSI data.

b. Operator provisions HSS/HLR subscriber data with IMS CAMEL service while the subscriber is currently registered in the IMS network i.e. one or more IM CSI data is added to the subscriber's profile in the HSS/HLR.

c. The HSS/HLR is notified of mobile termination for an unregistered subscriber (via Cx interface), and the subscriber is provisioned with IM CSI data

The IM-SSF address shall be deleted from the gsmSCF address list when the HSS/HLR is notified of the UE's deregistration.

The HSS/HLR procedure for sending the Notify Subscriber Data Change to the IM-SSF is the same procedure used for notifying the gsmSCFs in the Circuit Switched CN. This procedure is described in Procedure CAMEL_NSDC_HLR specified in TS 23.078.

The procedures specific to IM-SSF's handling of the Notify Subscriber Data Change is specified in this subclause:

- Procedure CAMEL_IMCN_HSS_Update_CSI

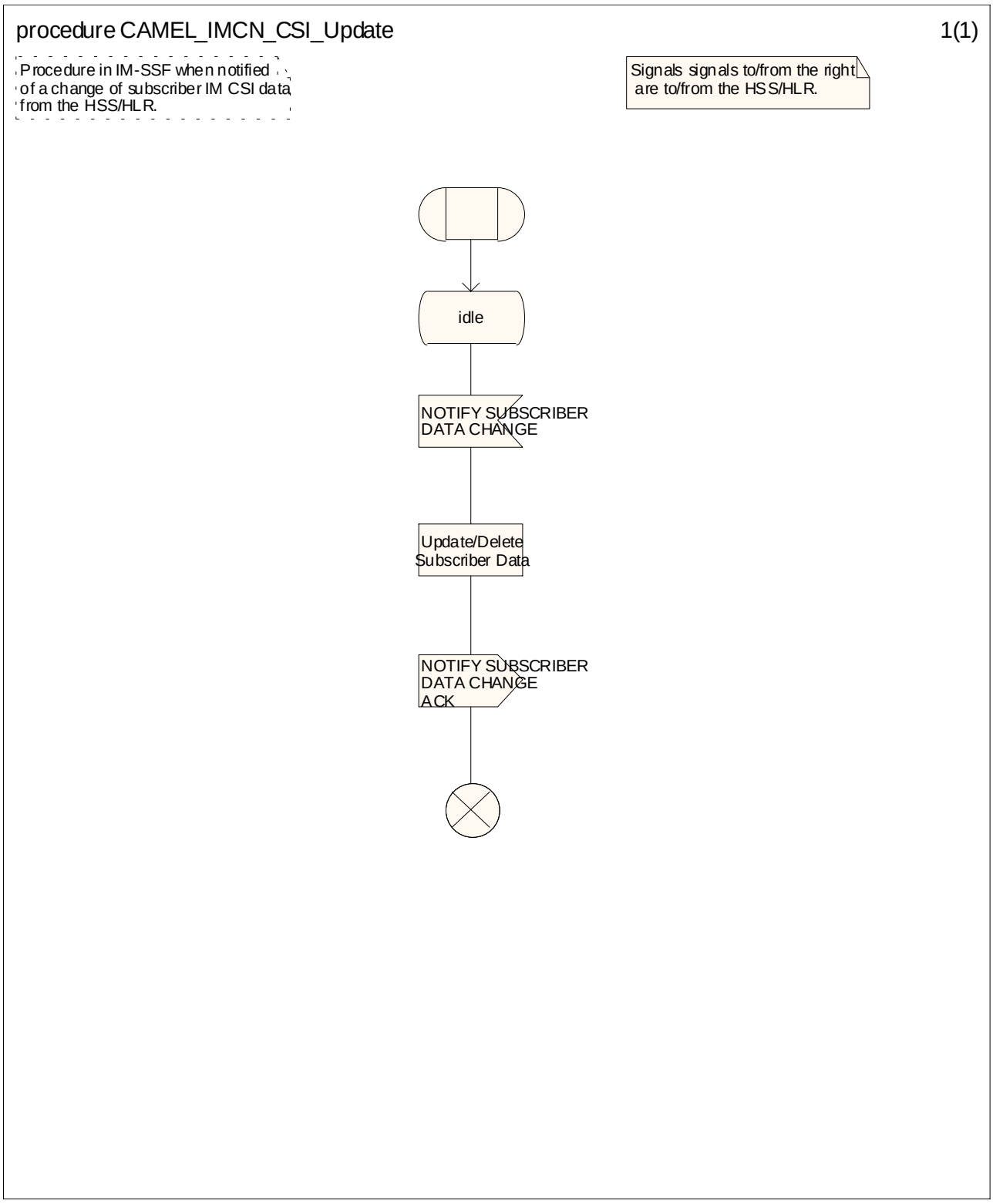

Figure 5.6a: Procedure CAMEL_IMCN_HSS_Update_CSI (sheet 1)

5.1.2 Handling of Mobile Originated Calls in the IM-SSF

The functional behaviour of the S-CSCF is specified in 3GPP TS 23.218 [5]. The procedures specific to CAMEL are specified in this subclause:

- Procedure CAMEL_IMCN_MO_INVITE;
- Procedure CAMEL_IMCN_MO_BYE;
- Procedure CAMEL_IMCN_MO_CANCEL;
- Procedure CAMEL_IMCN_MO_Response_Code.

5.1.2.1 Actions of the IM-SSF on receipt of Int_Error

The IM-SSF checks the default Call Handling parameter in the relevant CSI.

If the default call handling is release, a BYE indication is sent to the MS. The IM-SSF then releases all resources and the invoked CAMEL procedure ends.

If the call handling is continue, the IM-SSF continues processing without CAMEL support.

5.1.2.2 Actions of the IM-SSF on receipt of Int_Continue

The IM-SSF continues processing without any modification of call parameters.

5.1.2.3 Actions of the IM-SSF on receipt of Int_Continue_With_Argument

The IM-SSF continues processing with modified call parameters. The IM-SSF shall modify the call parameters by the information received in the Int_Continue_With_Argument message. Call parameters that are not included in the Int_Continue_With_Argument_Message are unchanged.

5.1.2.4 Actions of the IM-SSF on receipt of Int_Connect

The IM-SSF continues processing with modified call parameters. The IM-SSF shall transparently modify the call parameters with the received information. Call parameters which are not included in the Int_Connect message are unchanged.

5.1.2.5 Actions of the IM-SSF on receipt of Int_Release_Call

A BYE is sent to the MS, and a BYE is sent to the destination CSCF. The release cause received in the Int_Release_Call is used. The IM-SSF then releases all call resources and all CAMEL processing ends.

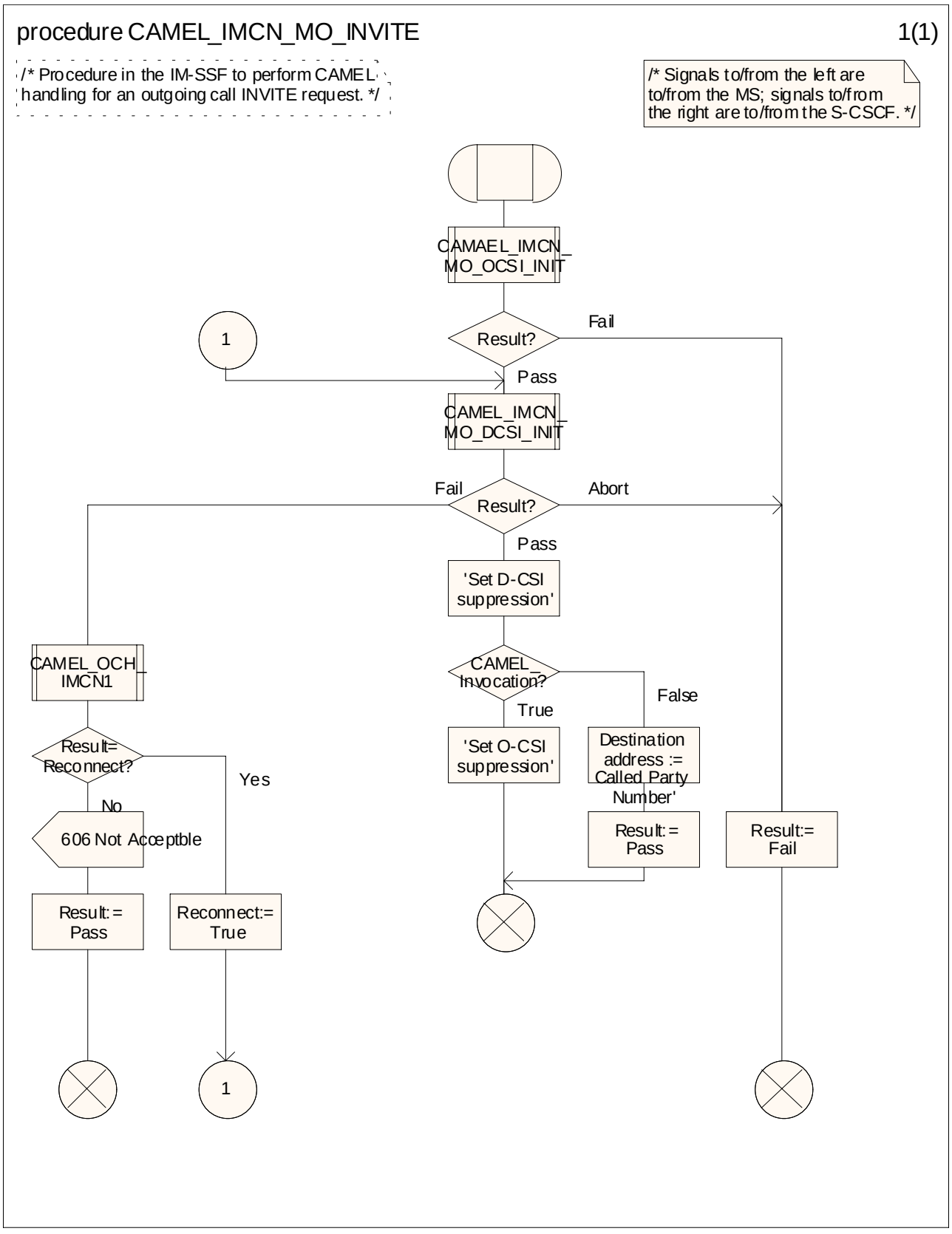

Figure 5.7a: Procedure CAMEL_IMCN_MO_INVITE (sheet 1)

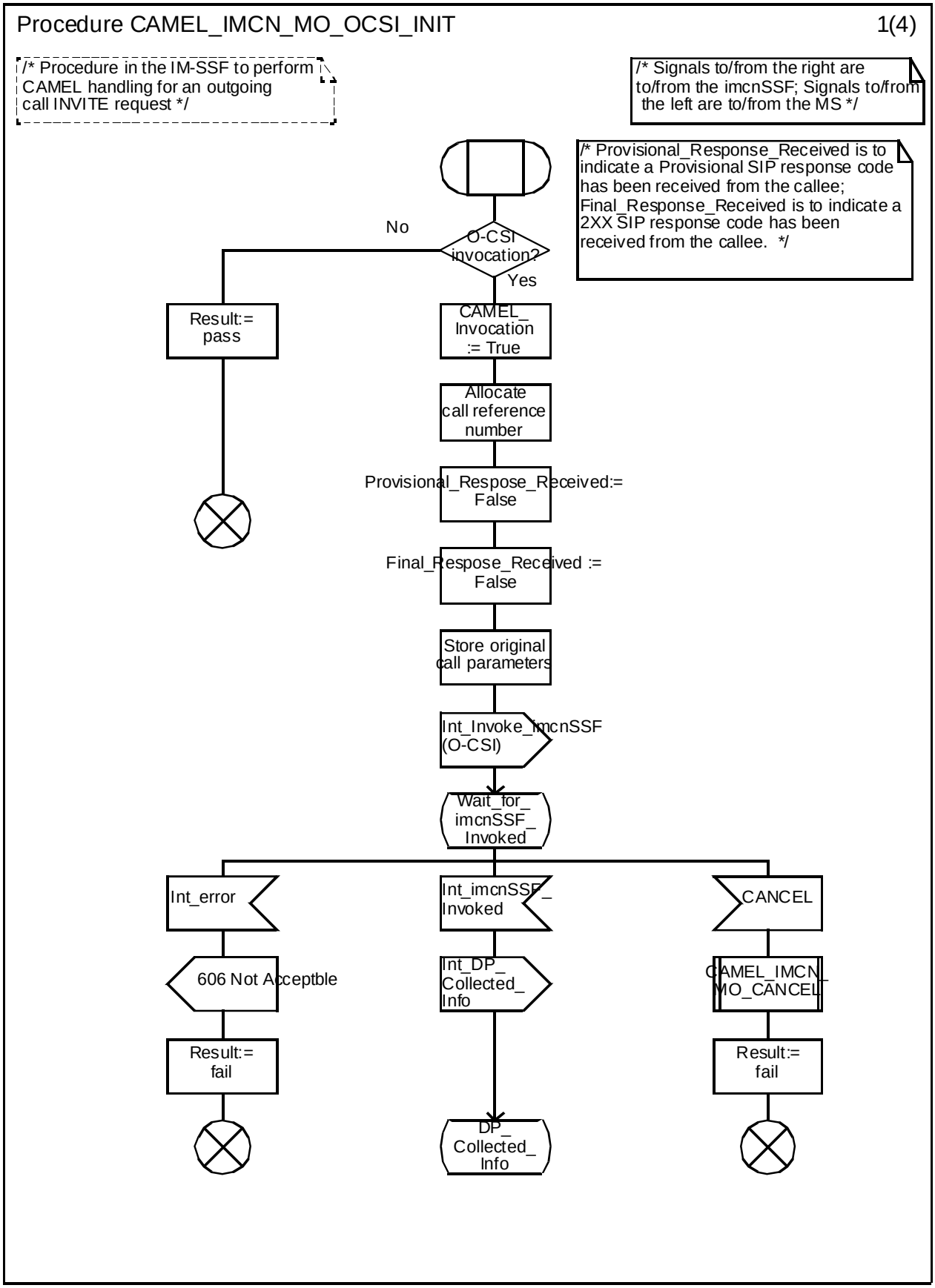

Figure 5.8a: Procedure CAMEL_IMCN_MO_OCSI_INIT (sheet 1)

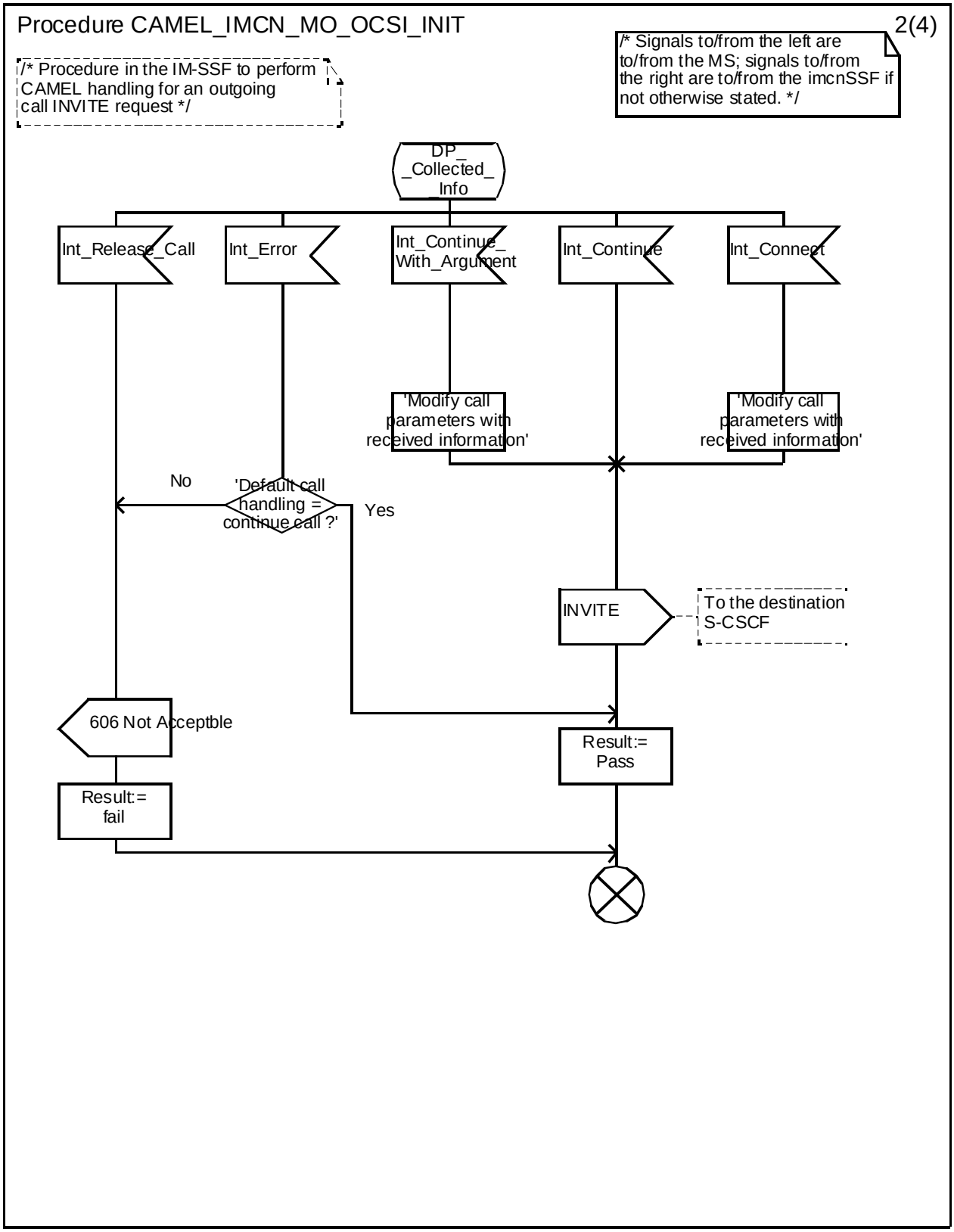

Figure 5.8b: Procedure CAMEL_IMCN_MO_OCSI_INIT (sheet 2)

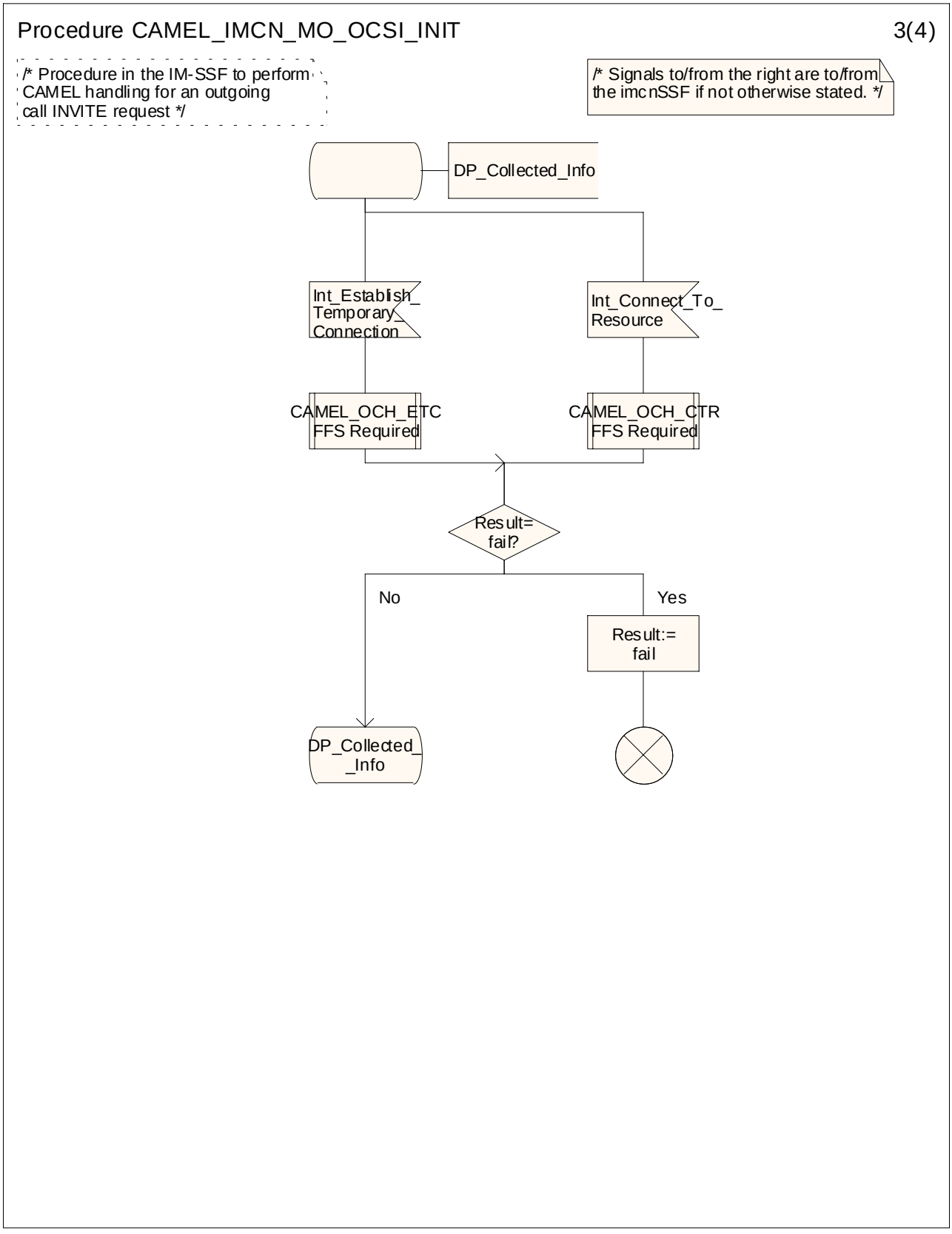

Figure 5.8c: Procedure CAMEL_IMCN_MO_OCSI_INIT (sheet 3)

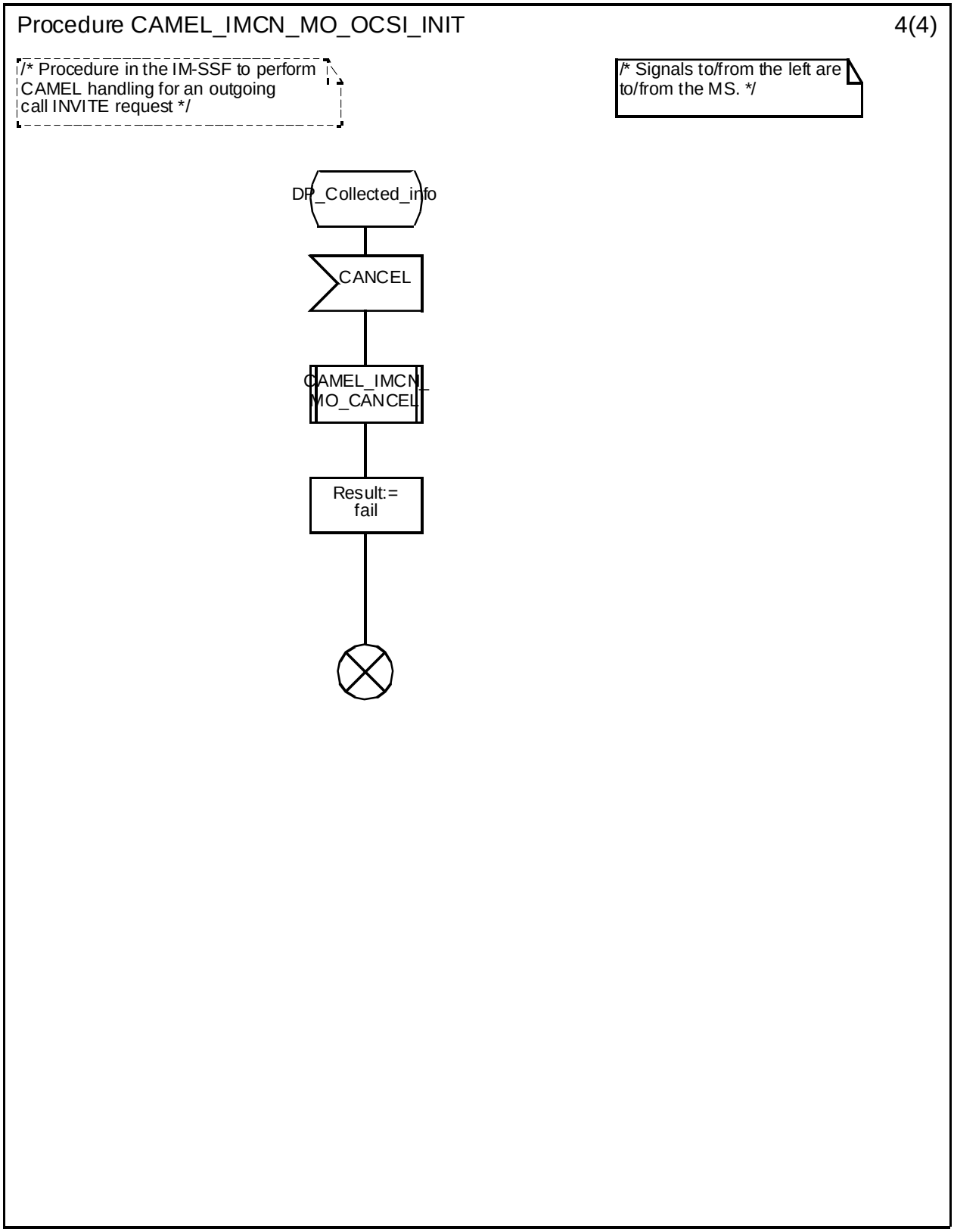

Figure 5.8d: Procedure CAMEL_IMCN_MO_OCSI_INIT (sheet 4)

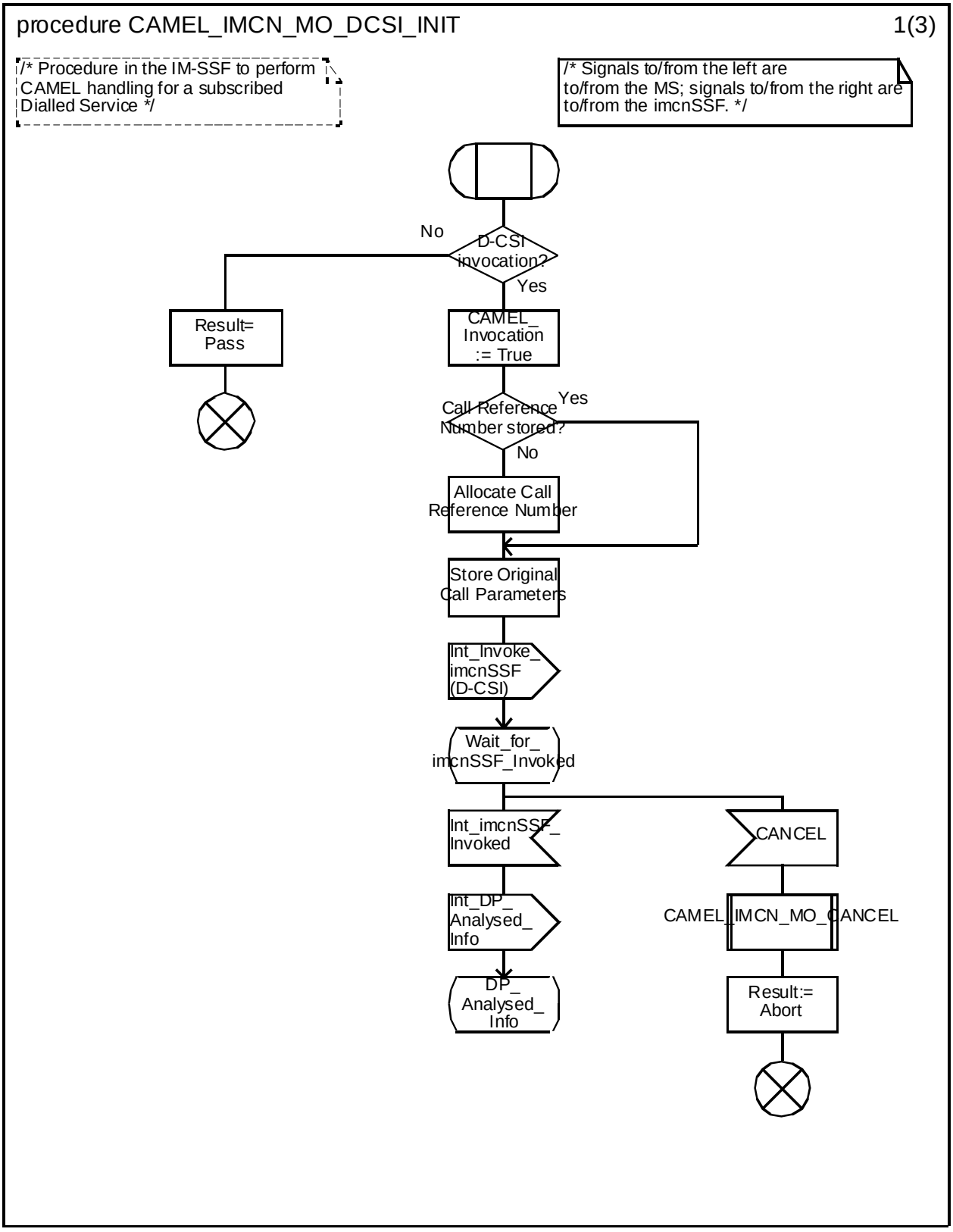

Figure 5.9a: Procedure CAMEL_IMCN_MO_DCSI_INIT (sheet 1)

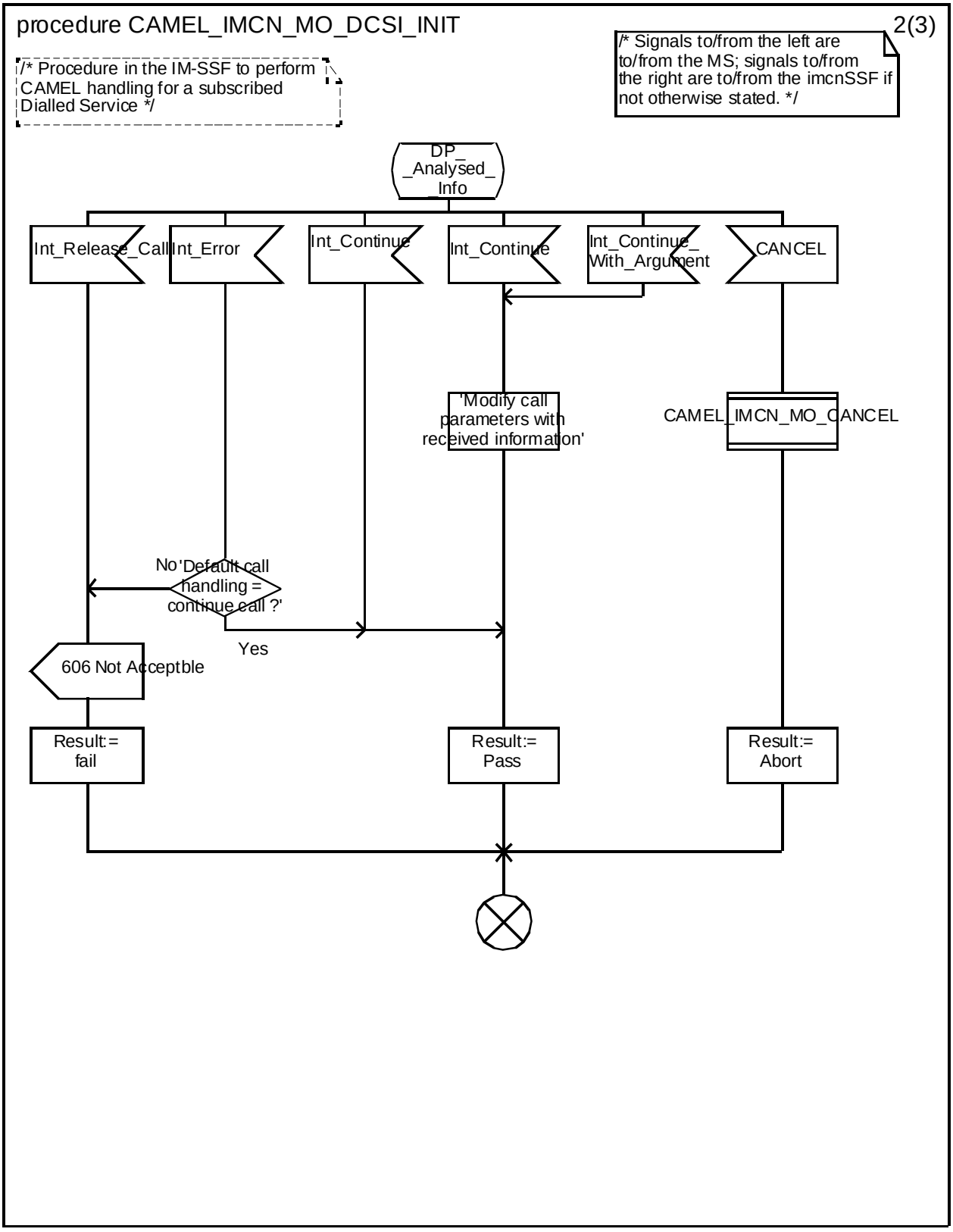

Figure 5.9b: Procedure CAMEL_IMCN_MO_DCSI_INIT (sheet 2)

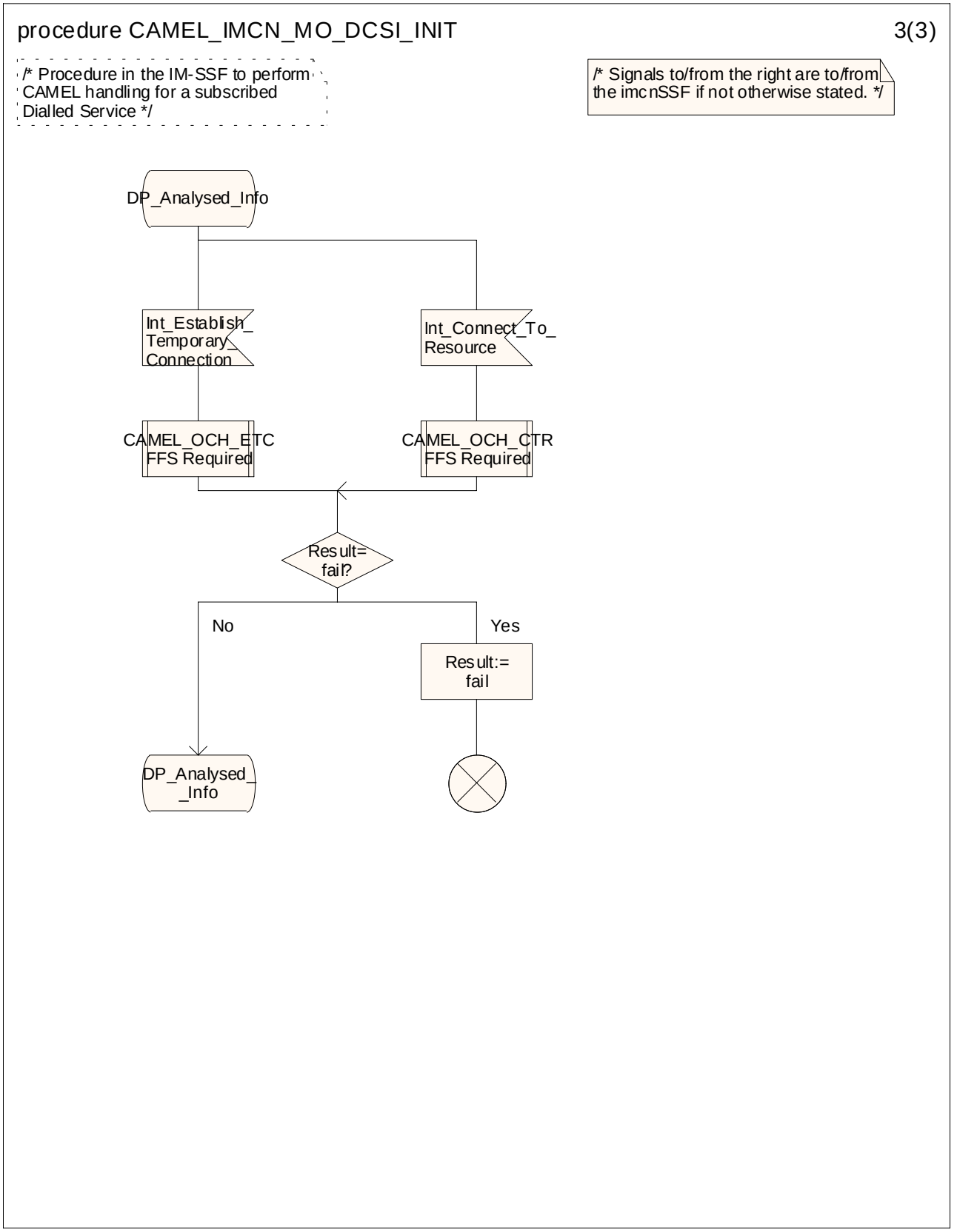

Figure 5.9c: Procedure CAMEL_IMCN_MO_DCSI_INIT (sheet 3)

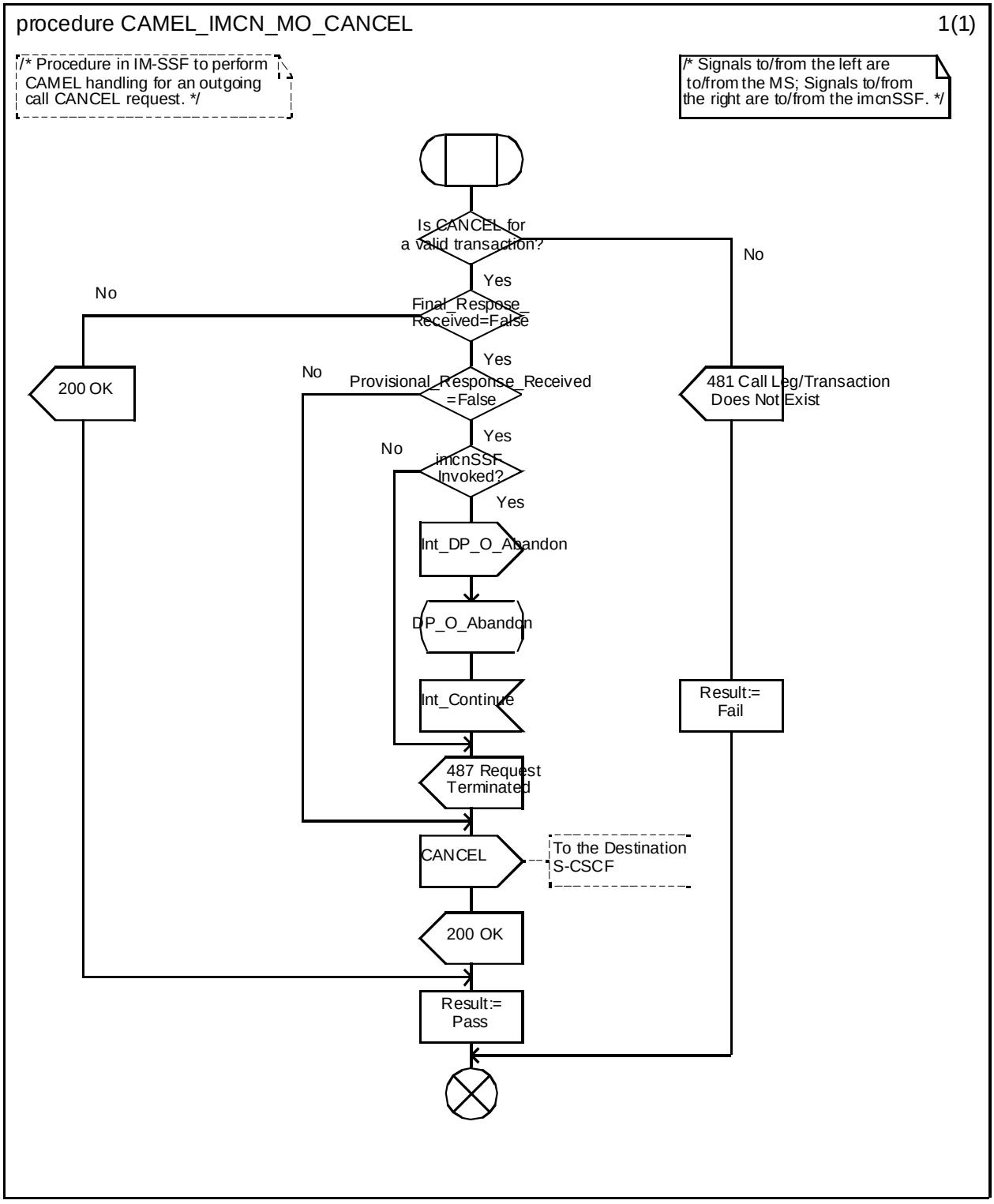

Figure 5.10a: Procedure CAMEL_IMCN_MO_CANCEL (sheet 1)

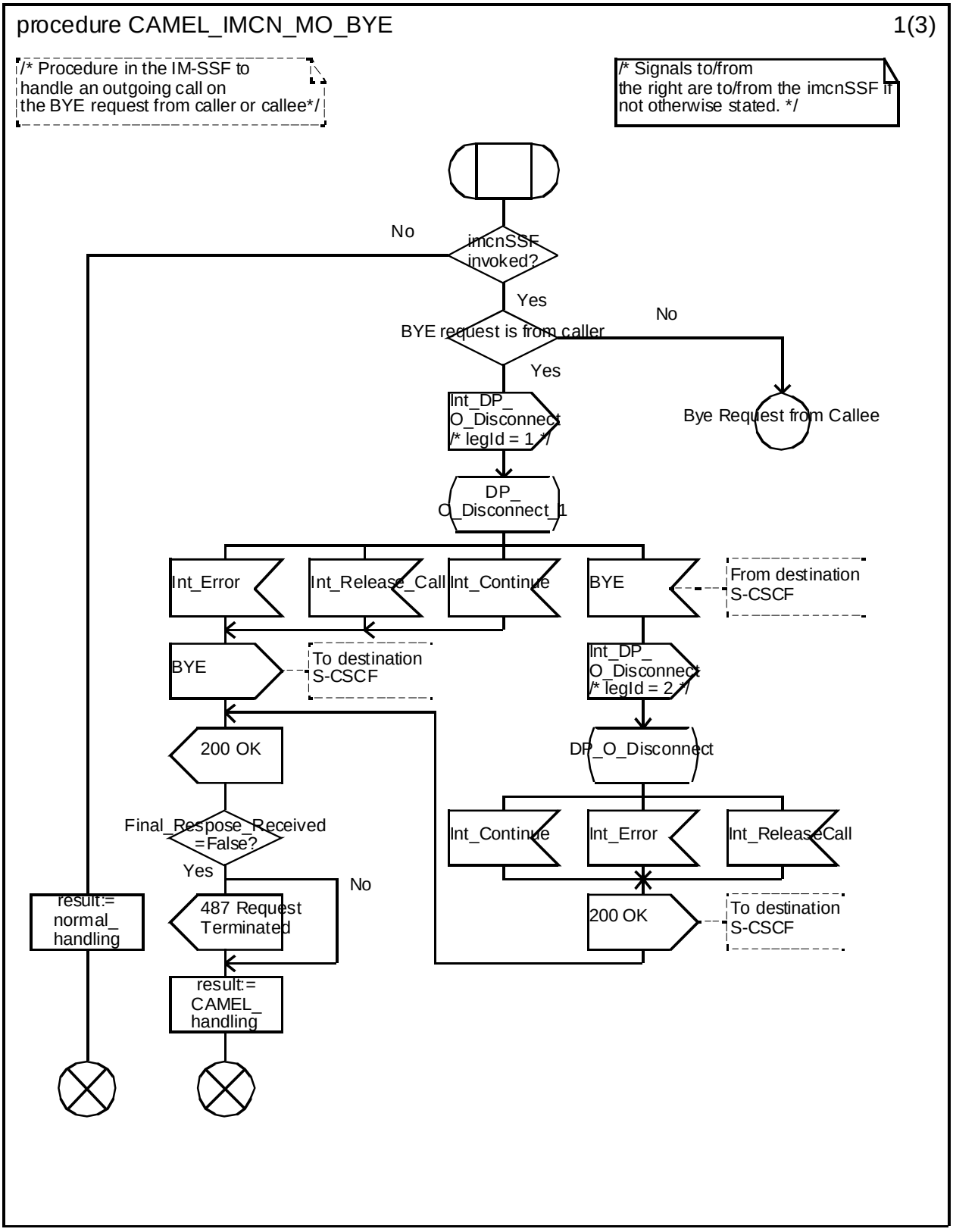

Figure 5.11a: Procedure CAMEL_IMCN_MO_BYE (sheet 1)

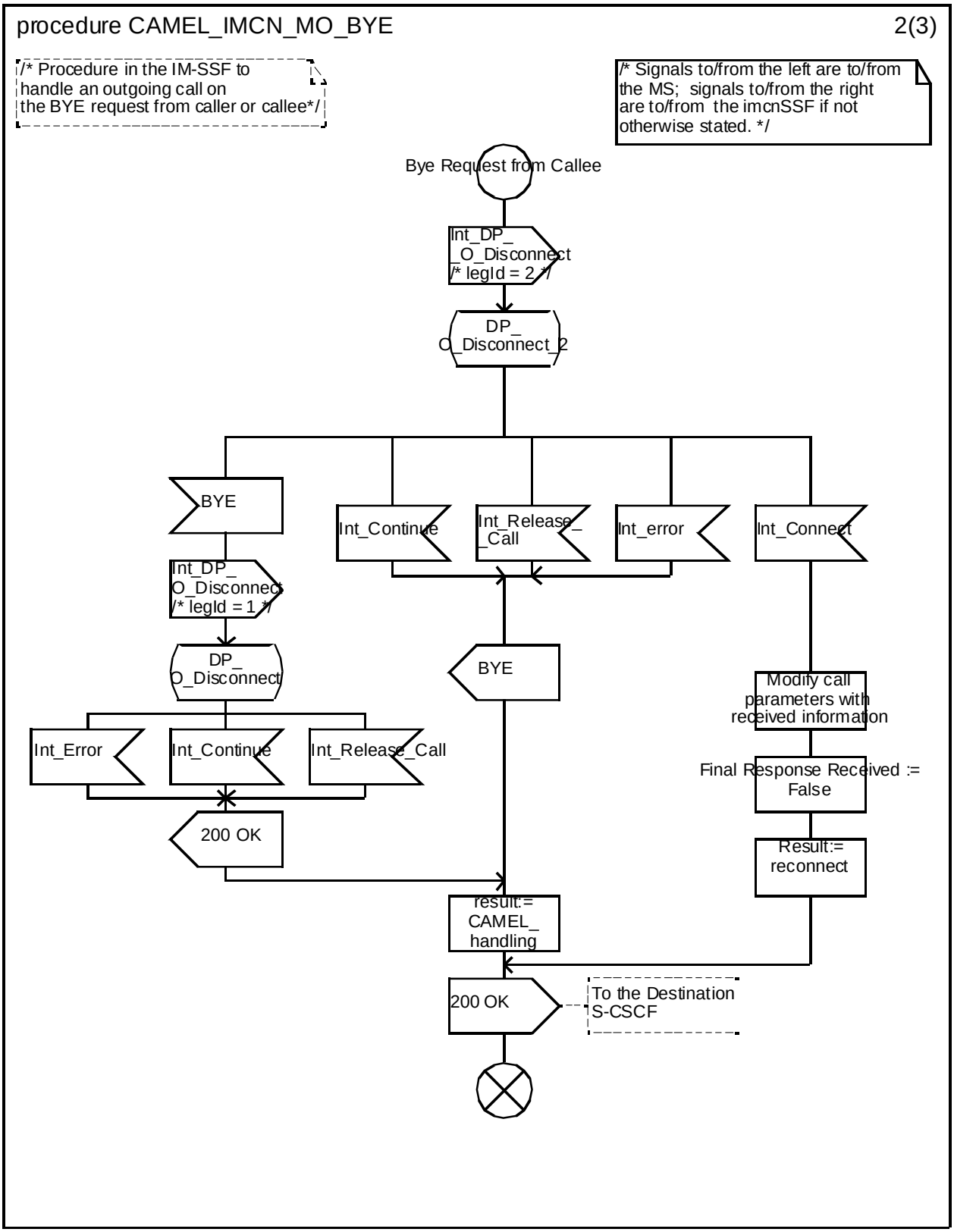

Figure 5.11b: Procedure CAMEL_IMCN_MO_BYE (sheet 2)

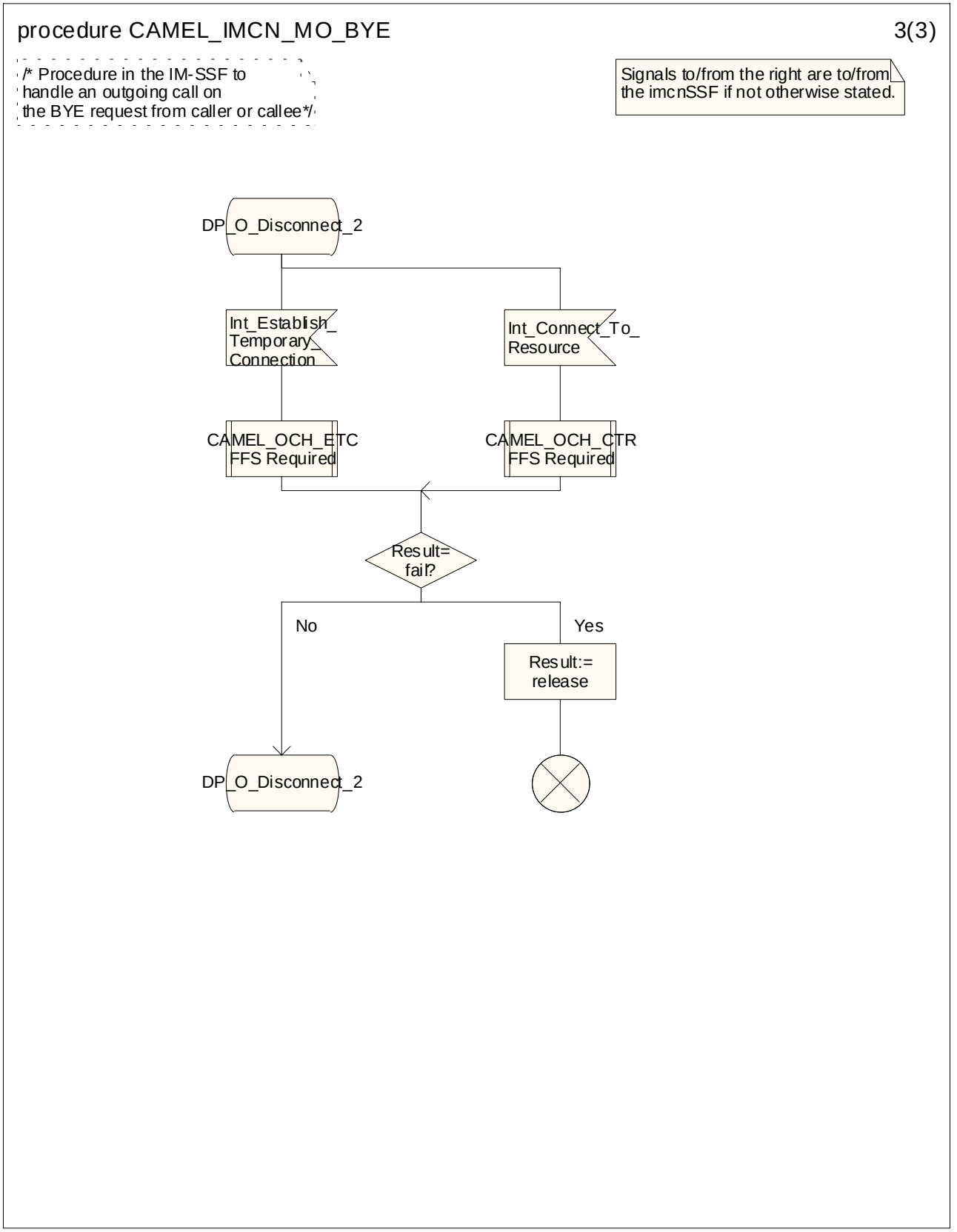

Figure 5.11c: Procedure CAMEL_IMCN_MO_BYE (sheet 3)

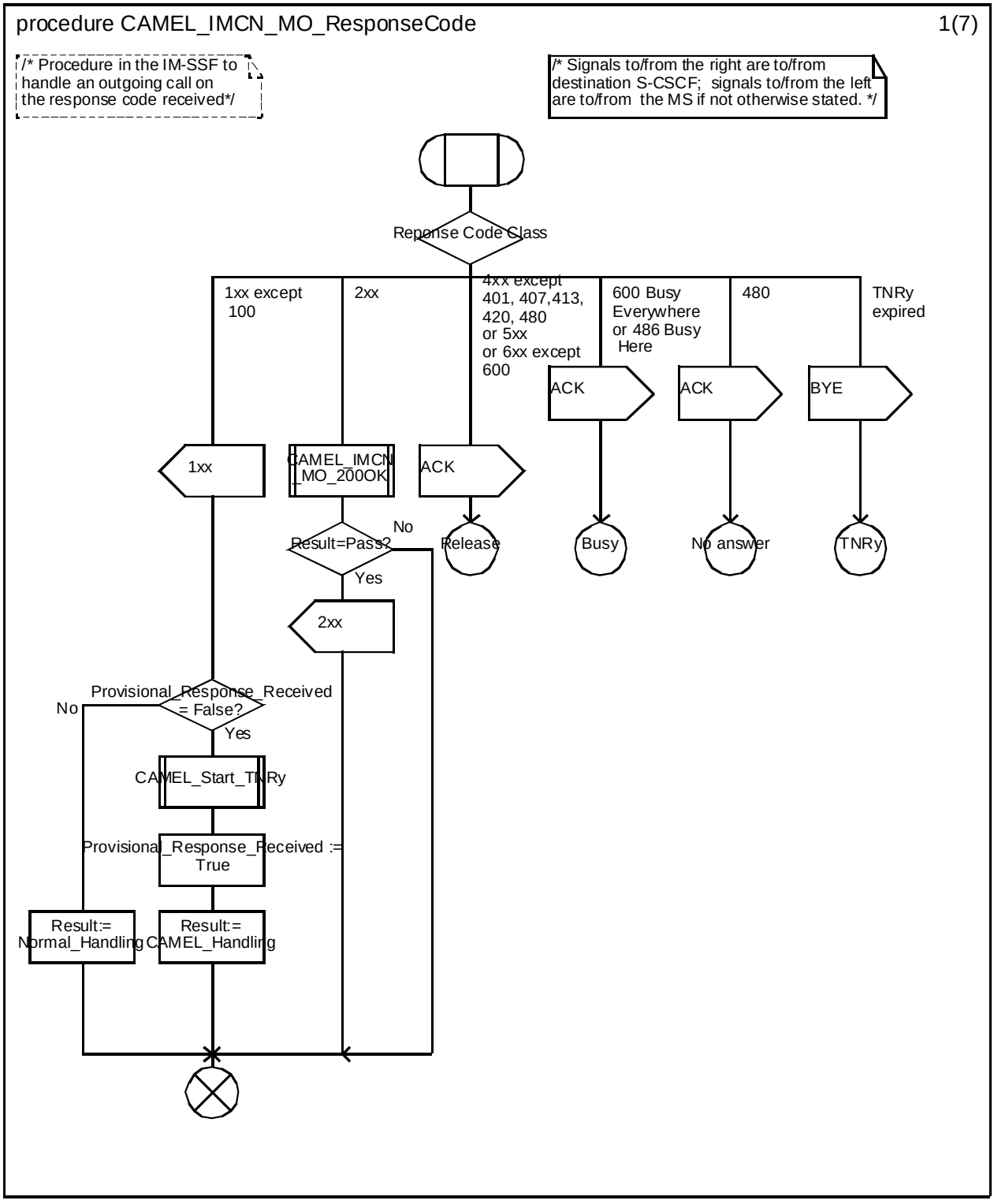

Figure 5.12a: Procedure CAMEL_IMCN_MO_ResponseCode (sheet1)

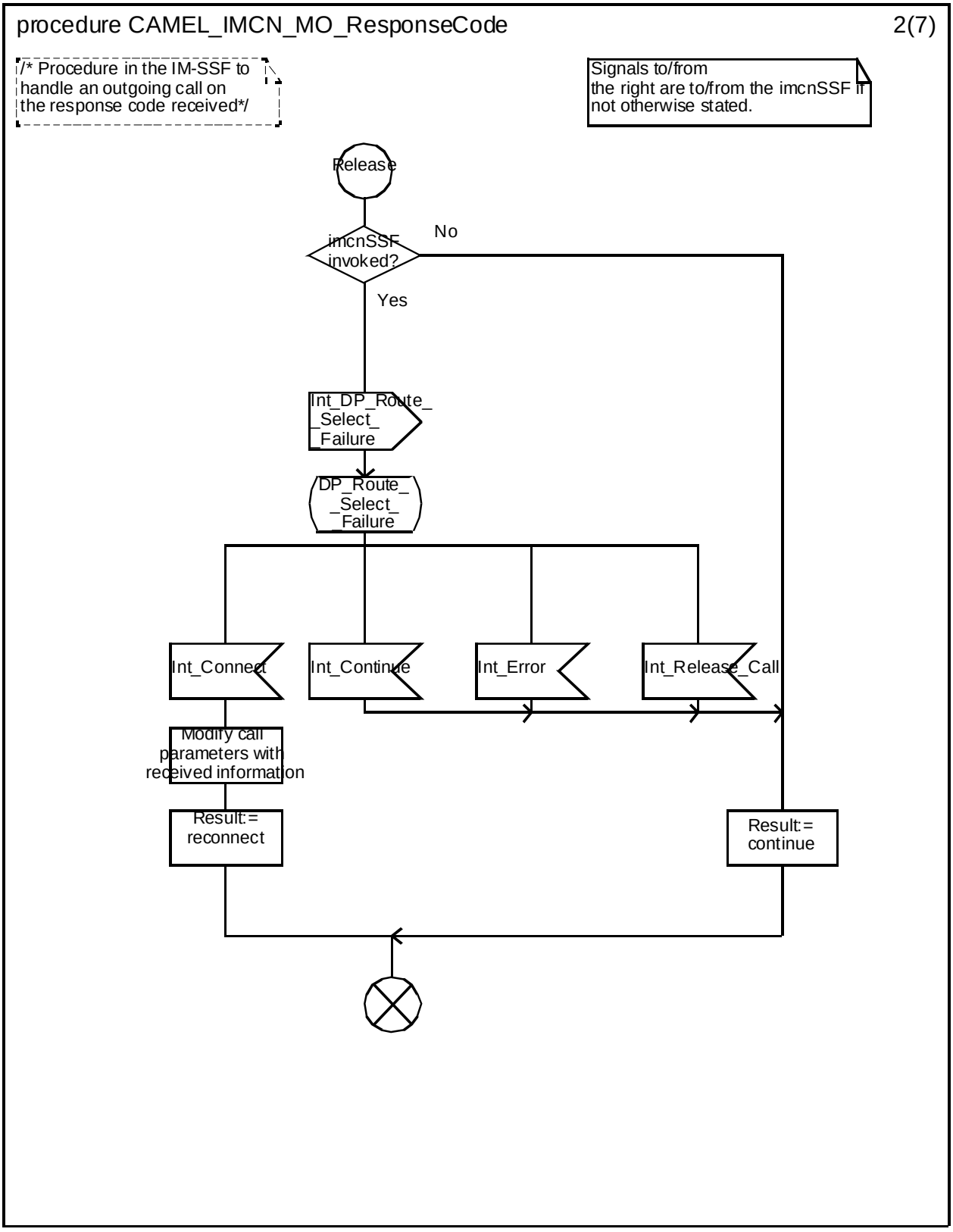

Figure 5.12b: Procedure CAMEL_IMCN_MO_ResponseCode (sheet 2)

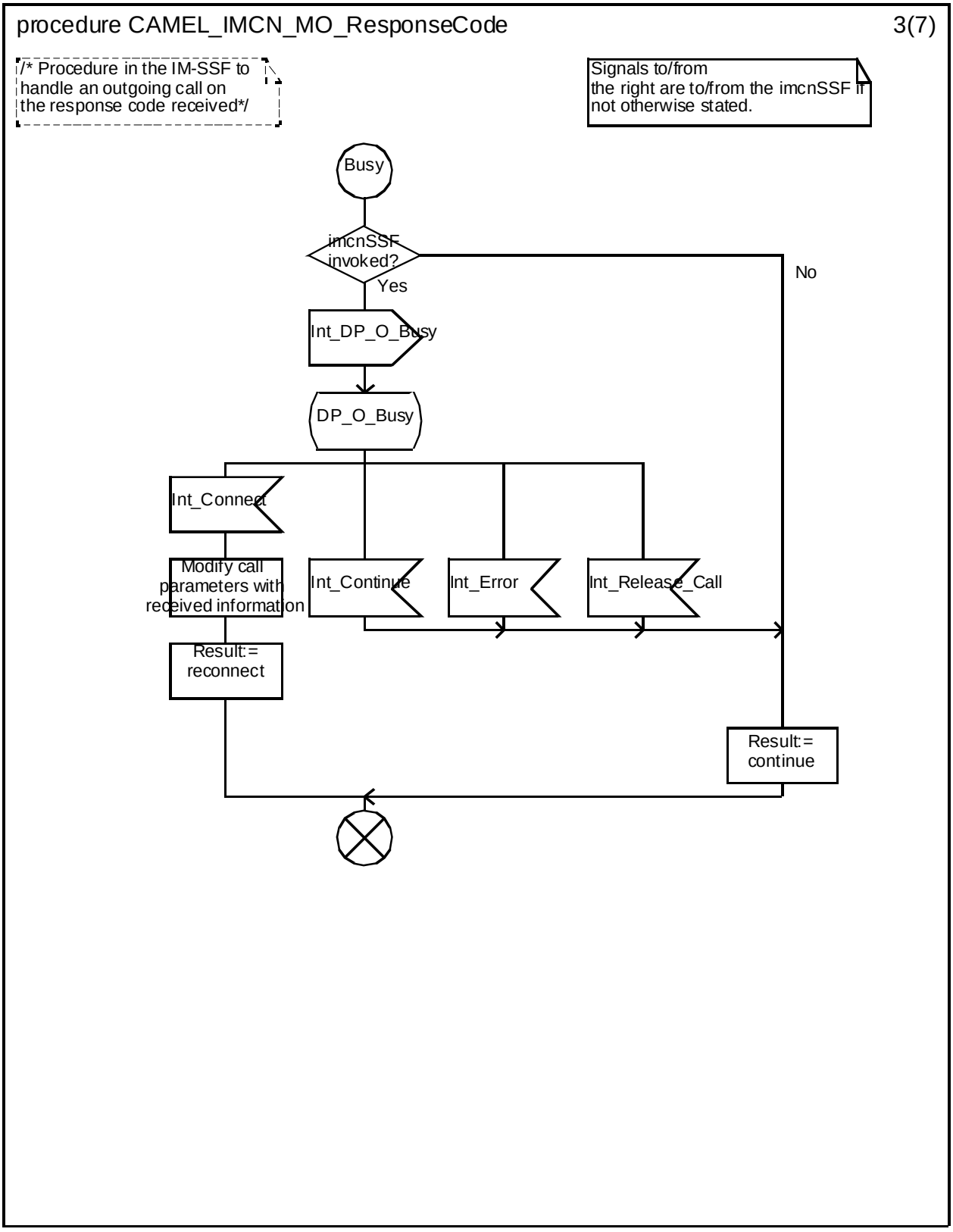

Figure 5.12c: Procedure CAMEL_IMCN_MO_ResponseCode (sheet 3)

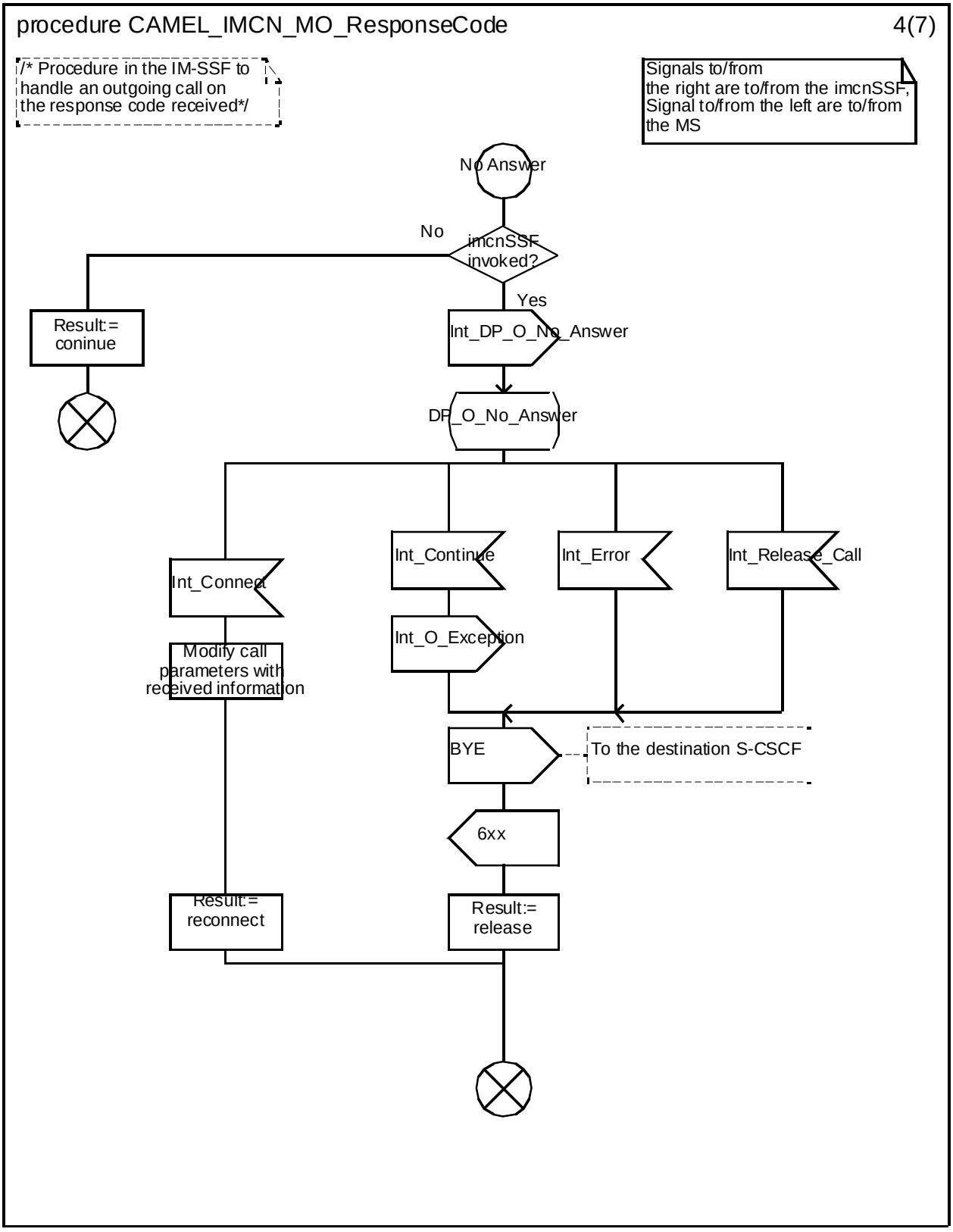

Figure 5.12d: Procedure CAMEL_IMCN_MO_ResponseCode (sheet 4)

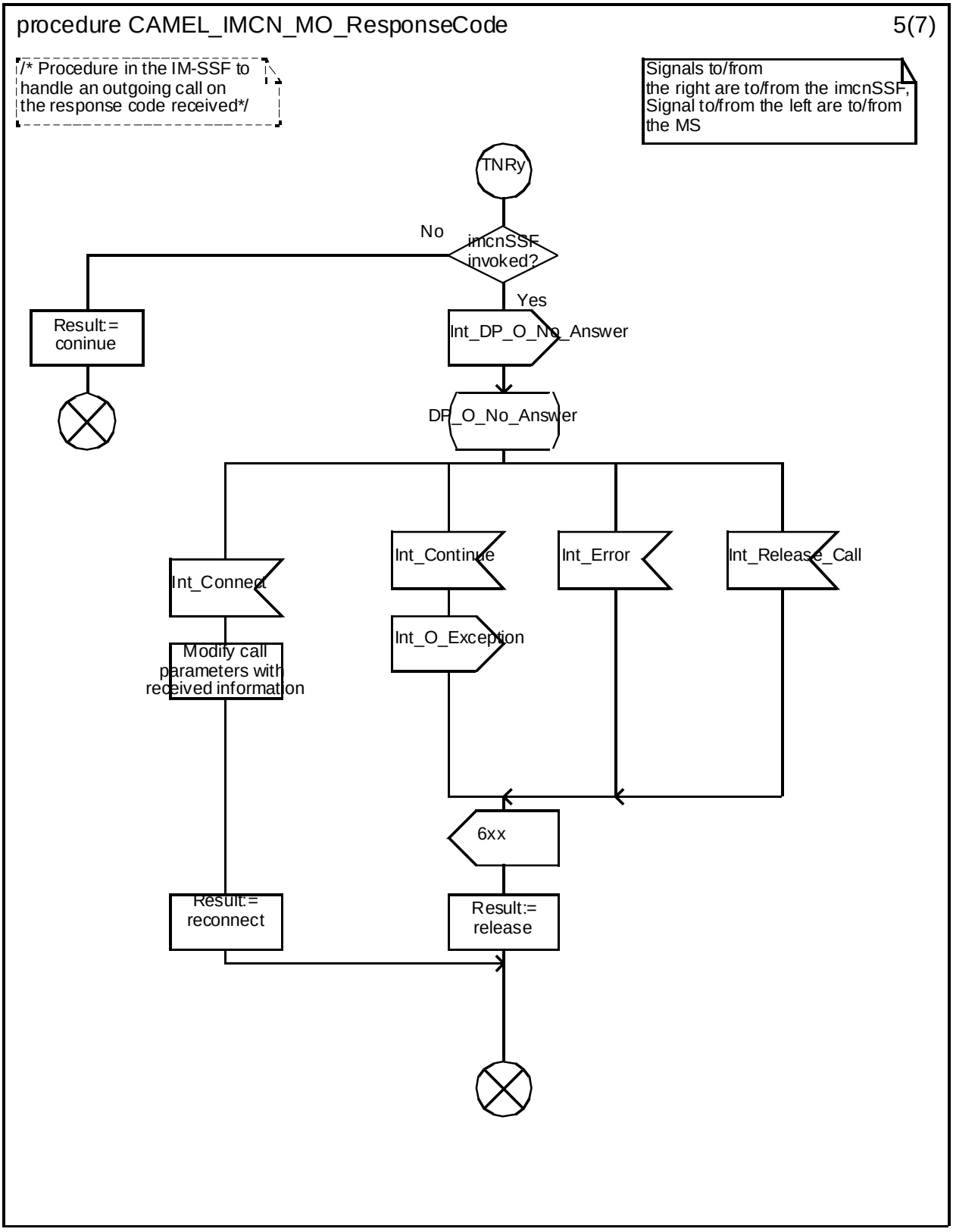

Figure 5.12e: Procedure CAMEL_IMCN_MO_ResponseCode (sheet 5)

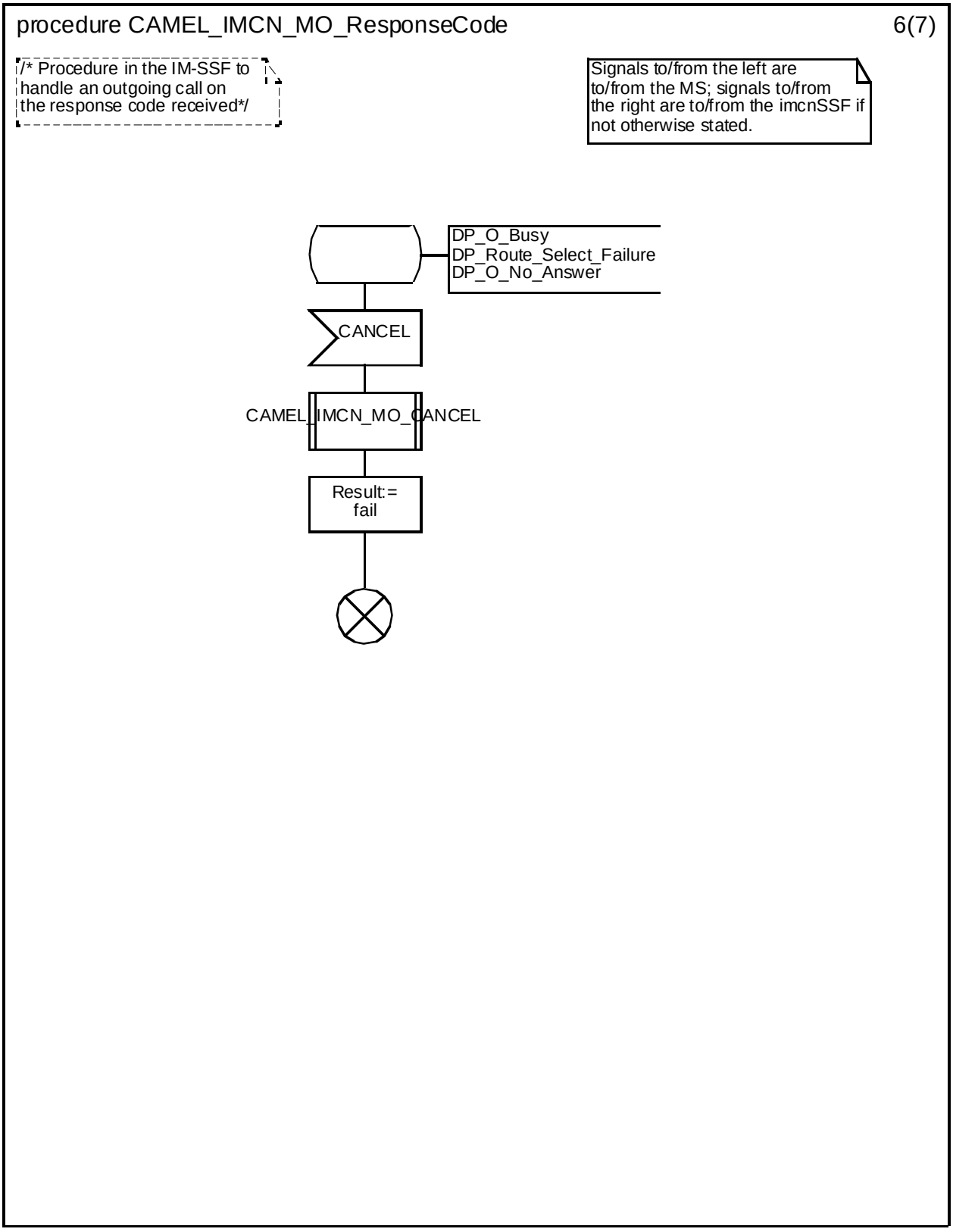

Figure 5.12f: Procedure CAMEL_IMCN_MO_ResponseCode (sheet 6)

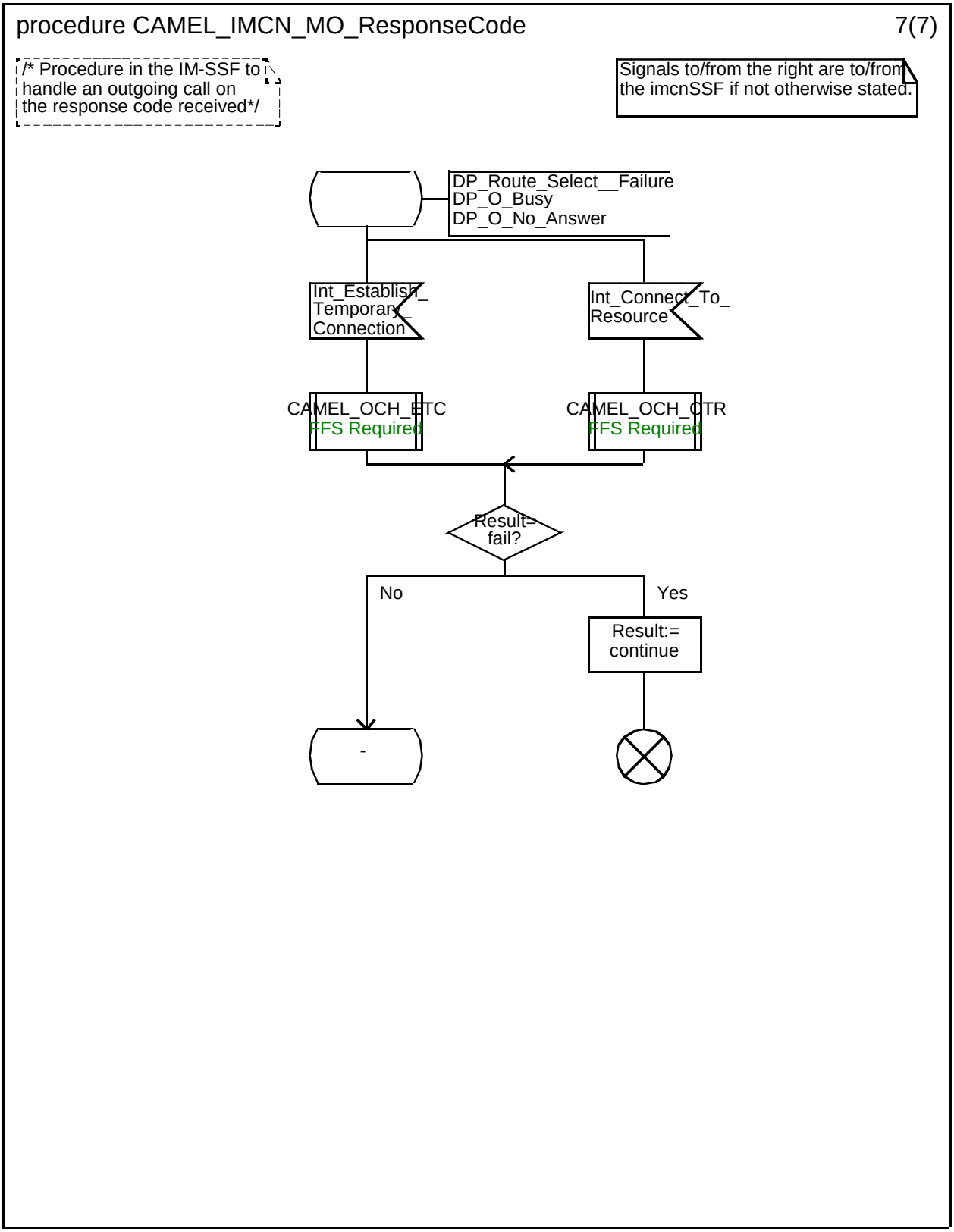

Figure 5.12g: Procedure CAMEL_IMCN_MO_ResponseCode (sheet 7)

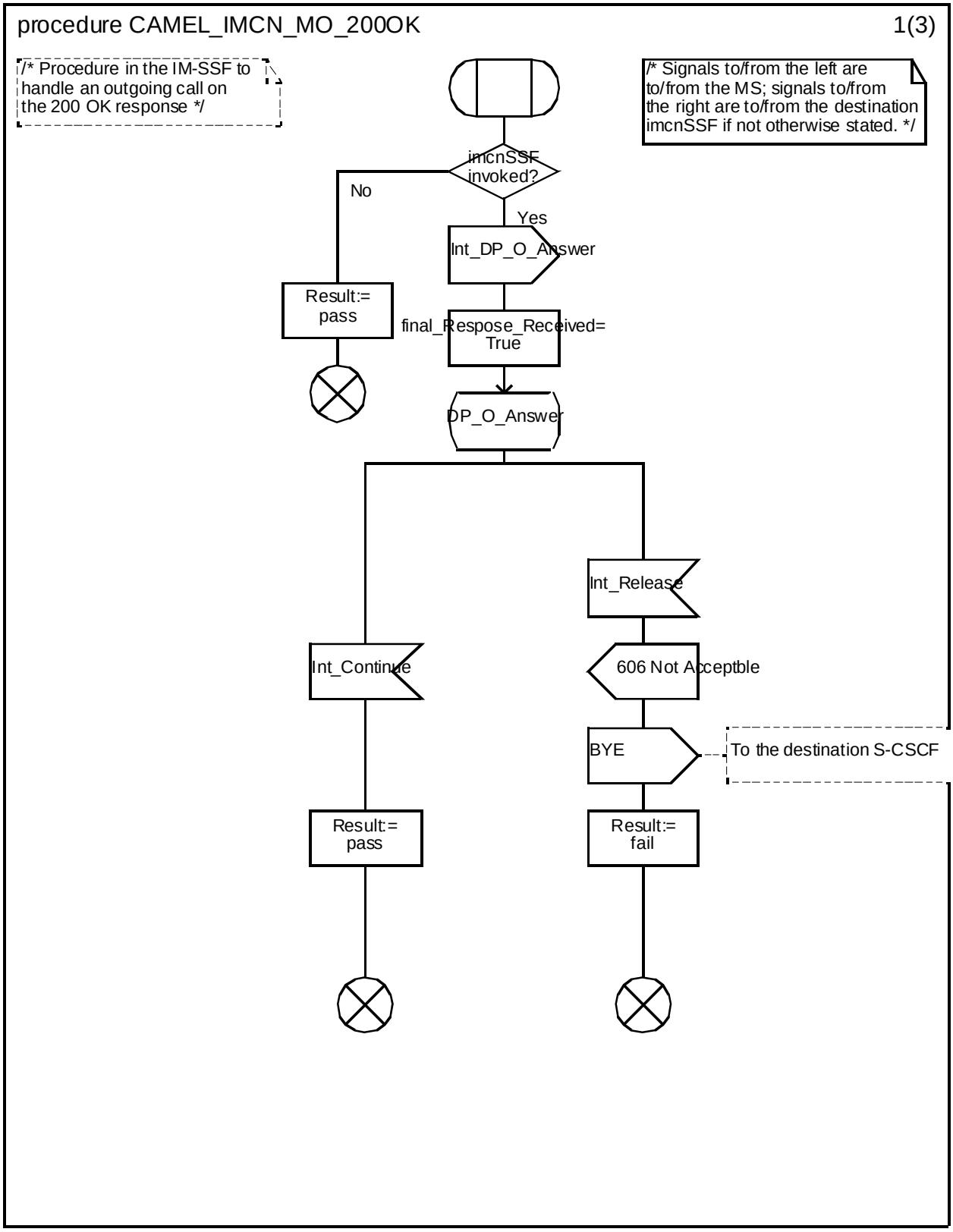

Figure 5.13a: Procedure CAMEL_IMCN_MO_200OK (sheet 1)

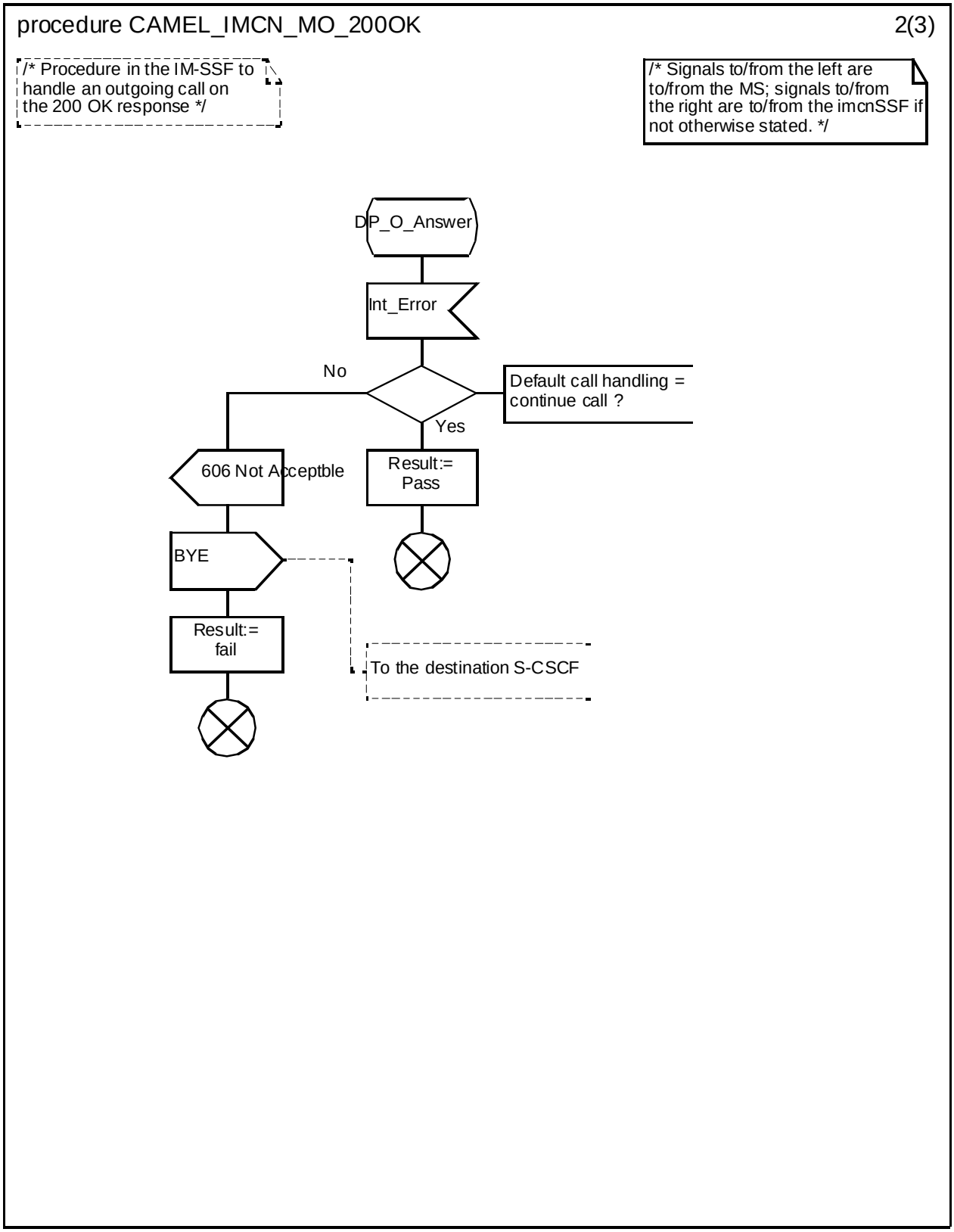

Figure 5.13b: Procedure CAMEL_IMCN_MO_200OK (sheet 2)

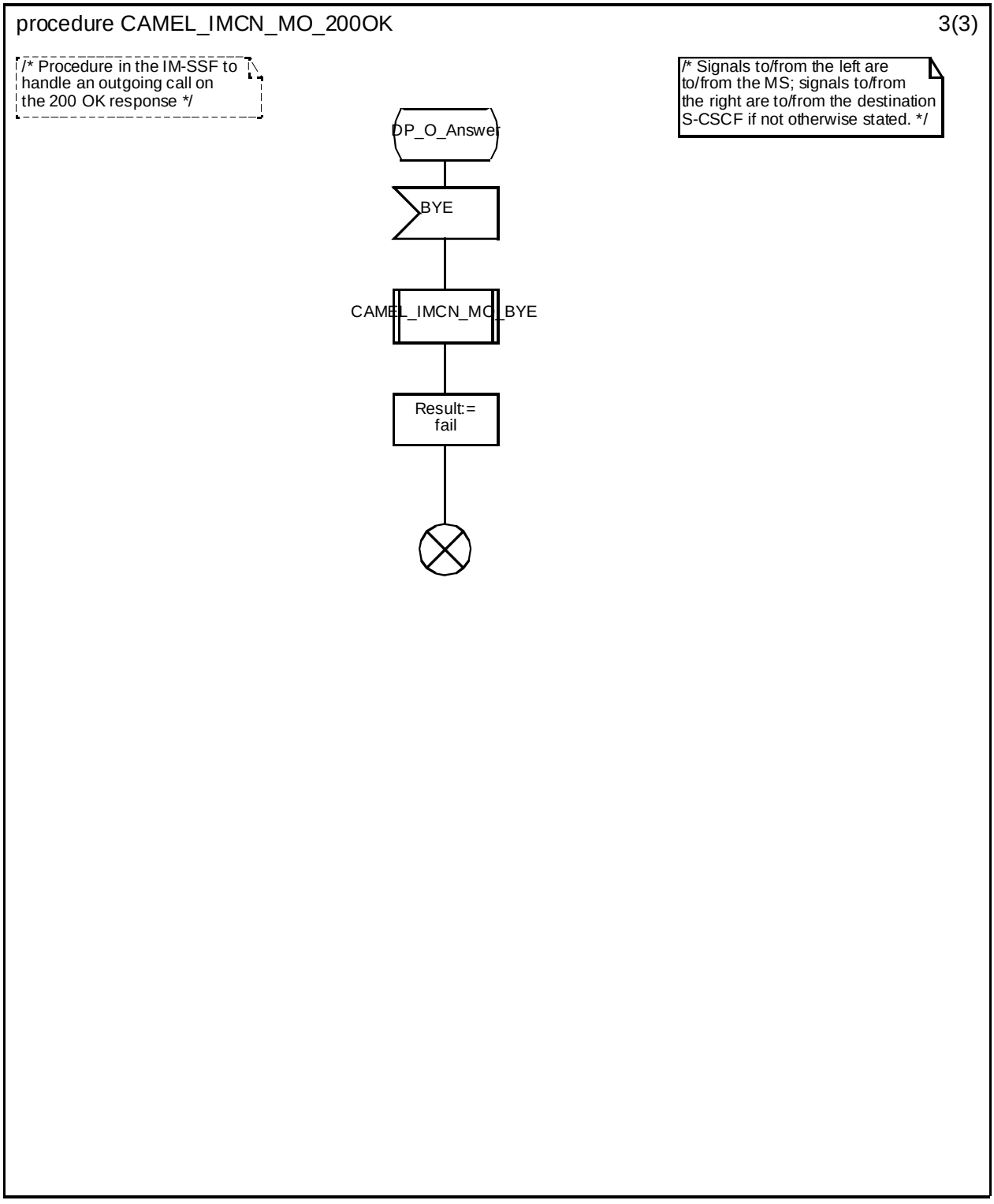

Figure 5.13c: Procedure CAMEL_IMCN_MO_200OK (sheet 3)

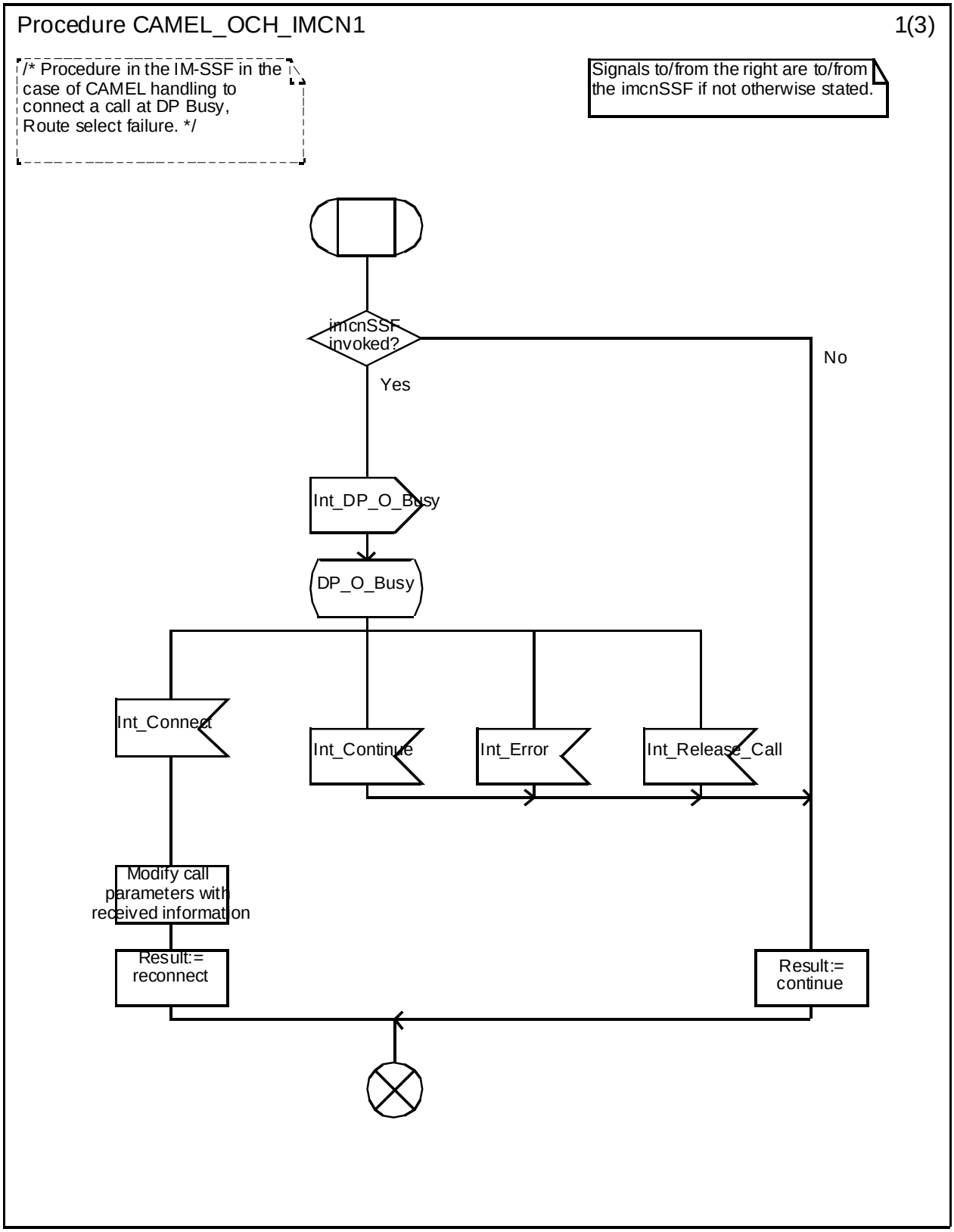

Figure 5.14a: Procedure CAMEL_OCH_IMCN1 (sheet 1)

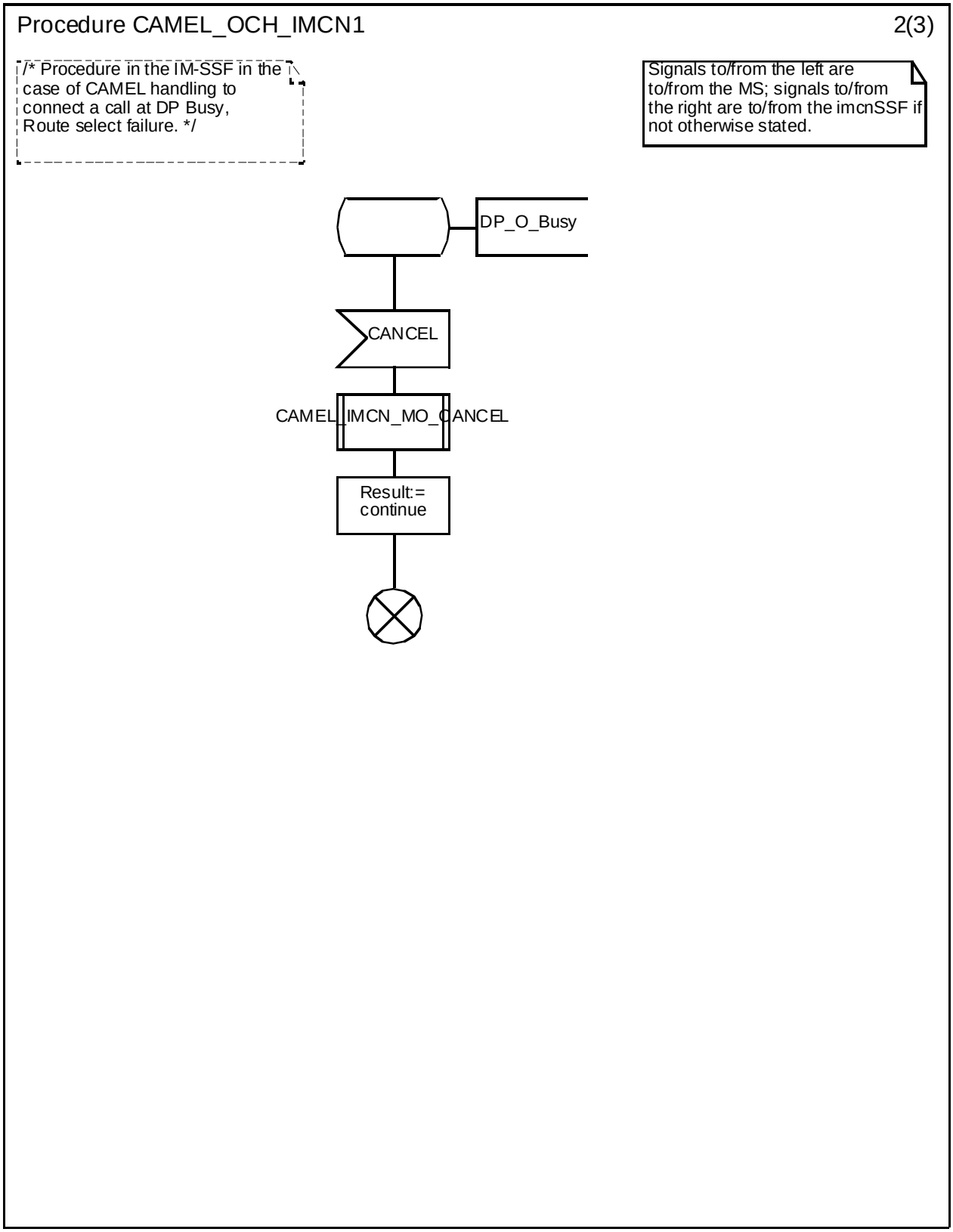

Figure 5.14b: Procedure CAMEL_OCH_IMCN1 (sheet 2)

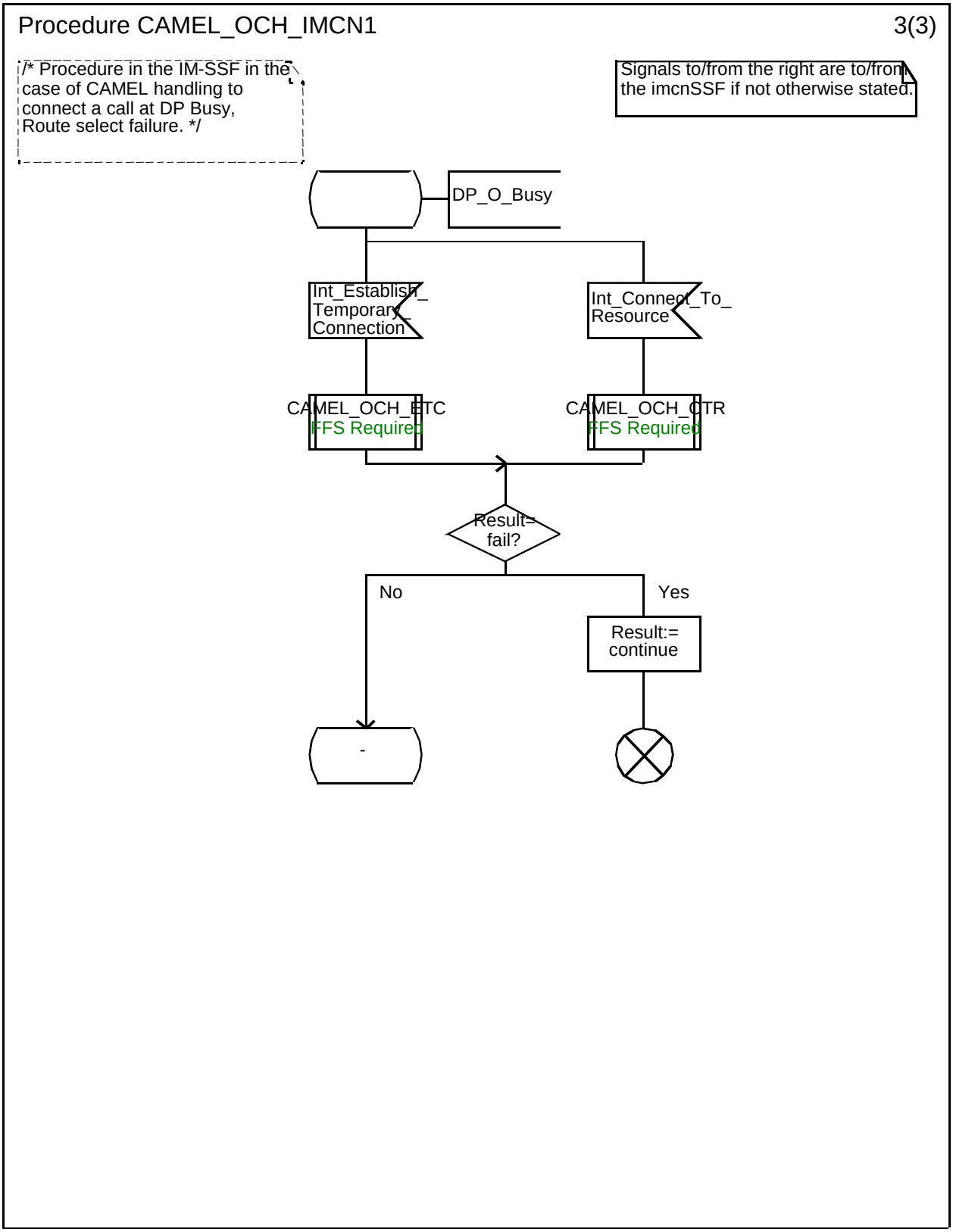

Figure 5.14c: Procedure CAMEL_OCH_IMCN1 (sheet 3)

5.1.3 Handling of Mobile Terminated Calls in the IM-SSF

The functional behaviour of the S-CSCF for handling terminating calls is specified in 3GPP TS 23.218 [5]. The procedures specific to CAMEL are specified in this subclause:

- Procedure CAMEL_IMCN_MT_INVITE;
- Procedure CAMEL_IMCN_MT_BYE;
- Procedure CAMEL_IMCN_MT_CANCEL
- Procedure CAMEL_IMCN_MT_Response_Code.

5.1.3.1 Actions of the IM-SSF on receipt of Int_Error

The IM-SSF checks the default Call Handling parameter in the relevant CSI.

If the default call handling is release, a BYE indication is sent to the originating CSCF. The IM-SSF then releases all resources and the invoked CAMEL procedure ends.

If the call handling is continue, the IM-SSF continues processing without CAMEL support.

5.1.3.2 Actions of the IM-SSF on receipt of Int_Release_Call

The IM-SSF BYE message is sent to the originating CSCF and resources are released.

5.1.3.3 Actions of the IM-SSF on receipt of Int_Continue_With_Argument

The IM-SSF shall replace the call parameters by the information received in the Int_Continue_With_Argument message. Call parameters that are not included in the Int_Continue_With_Argument_Message are unchanged.

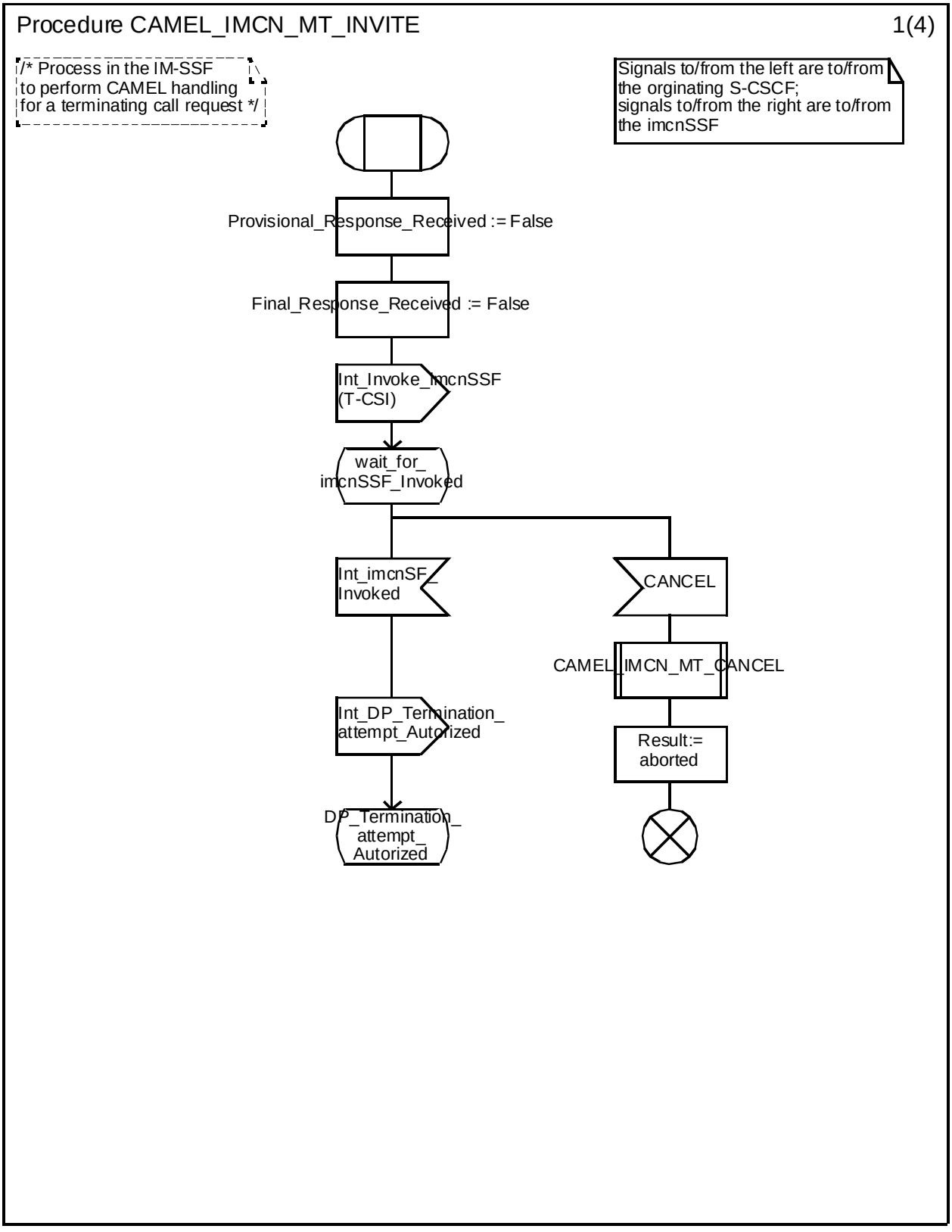

Figure 5.15a: Procedure CAMEL_IMCN_MT_INVITE (sheet 1)

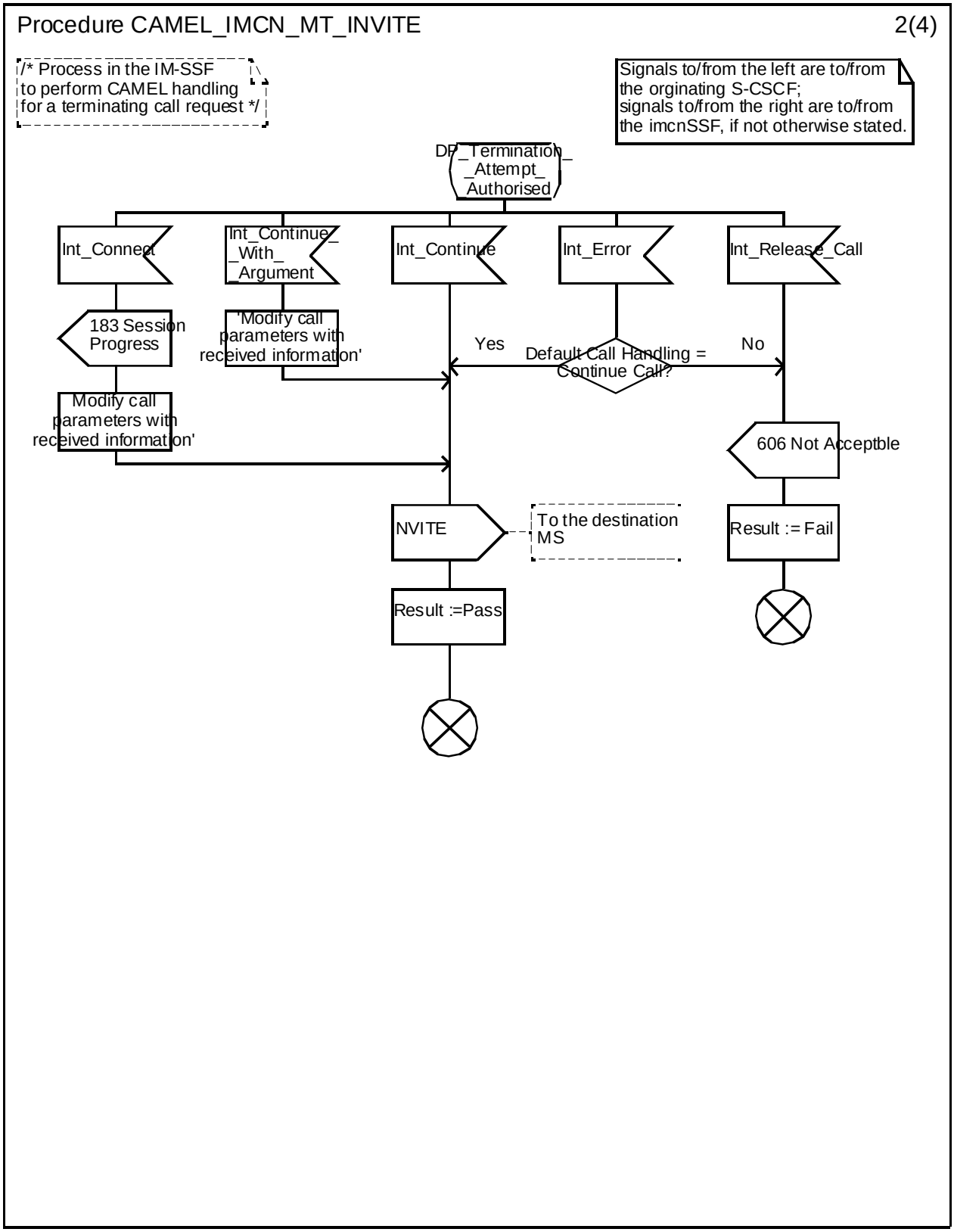

Figure 5.15b: Procedure CAMEL_IMCN_MT_INVITE (sheet 2)

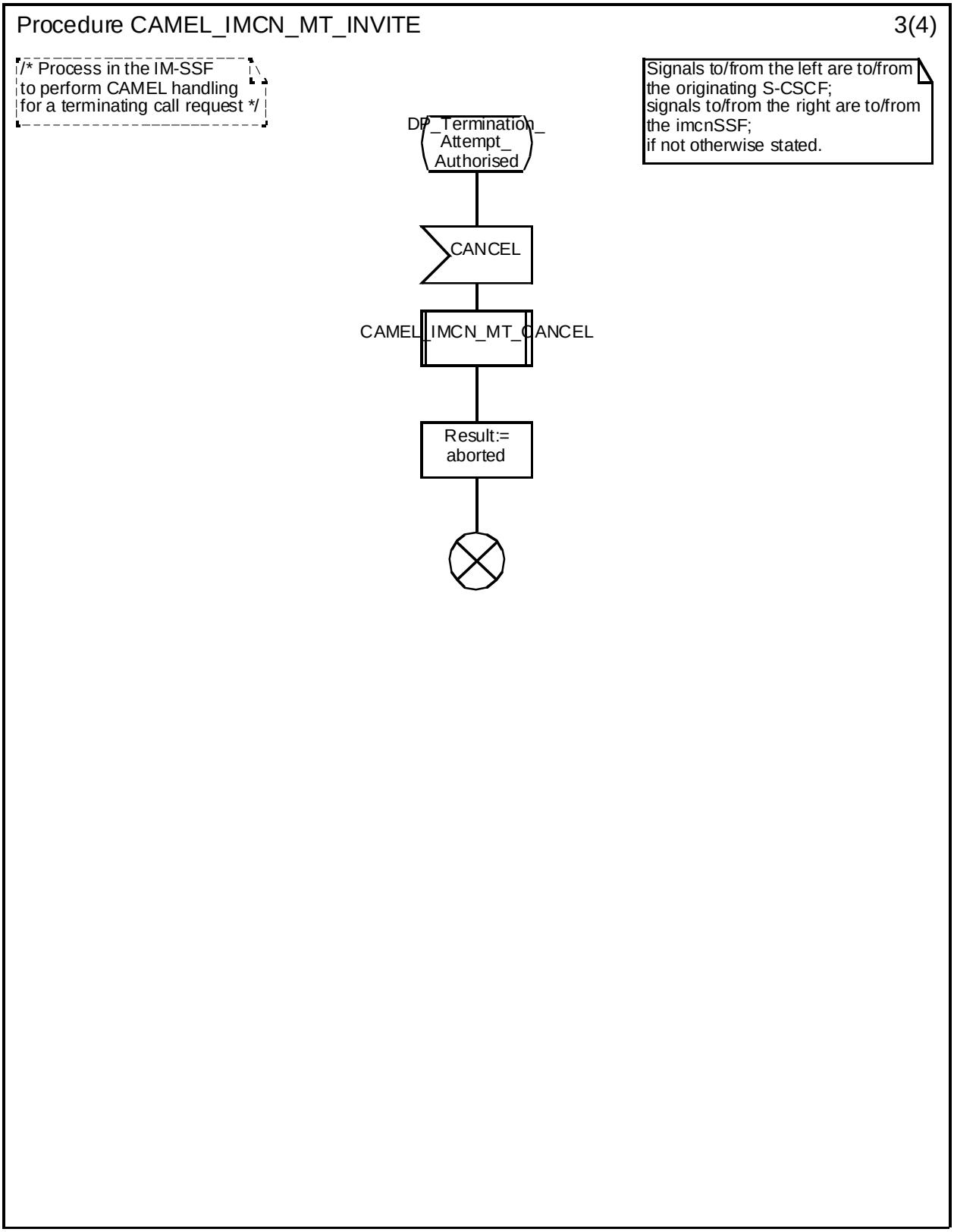

Figure 5.15c: Procedure CAMEL_IMCN_MT_INVITE (sheet 3)

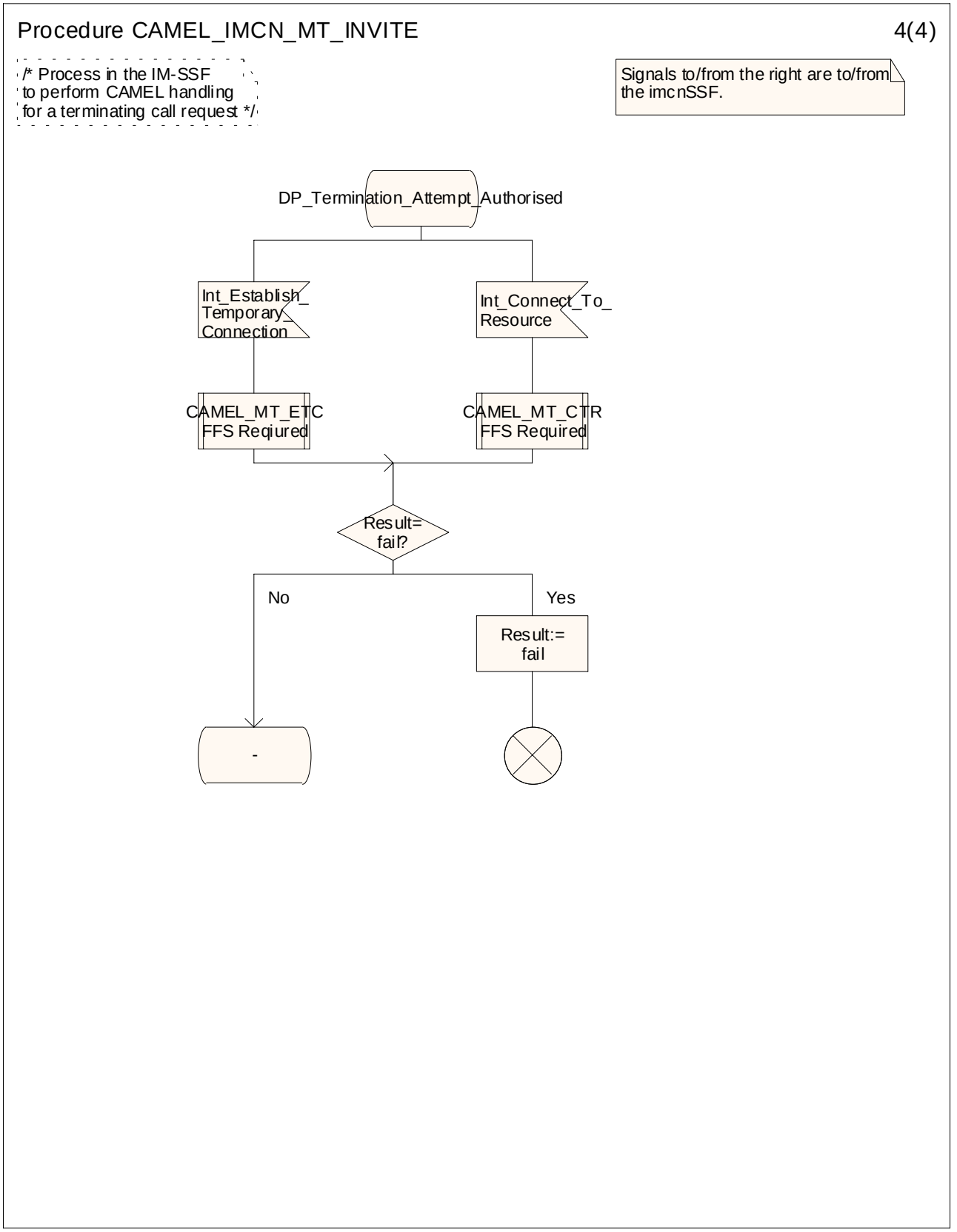

Figure 5.15d : Procedure CAMEL_IMCN_MT_INVITE (sheet 4)

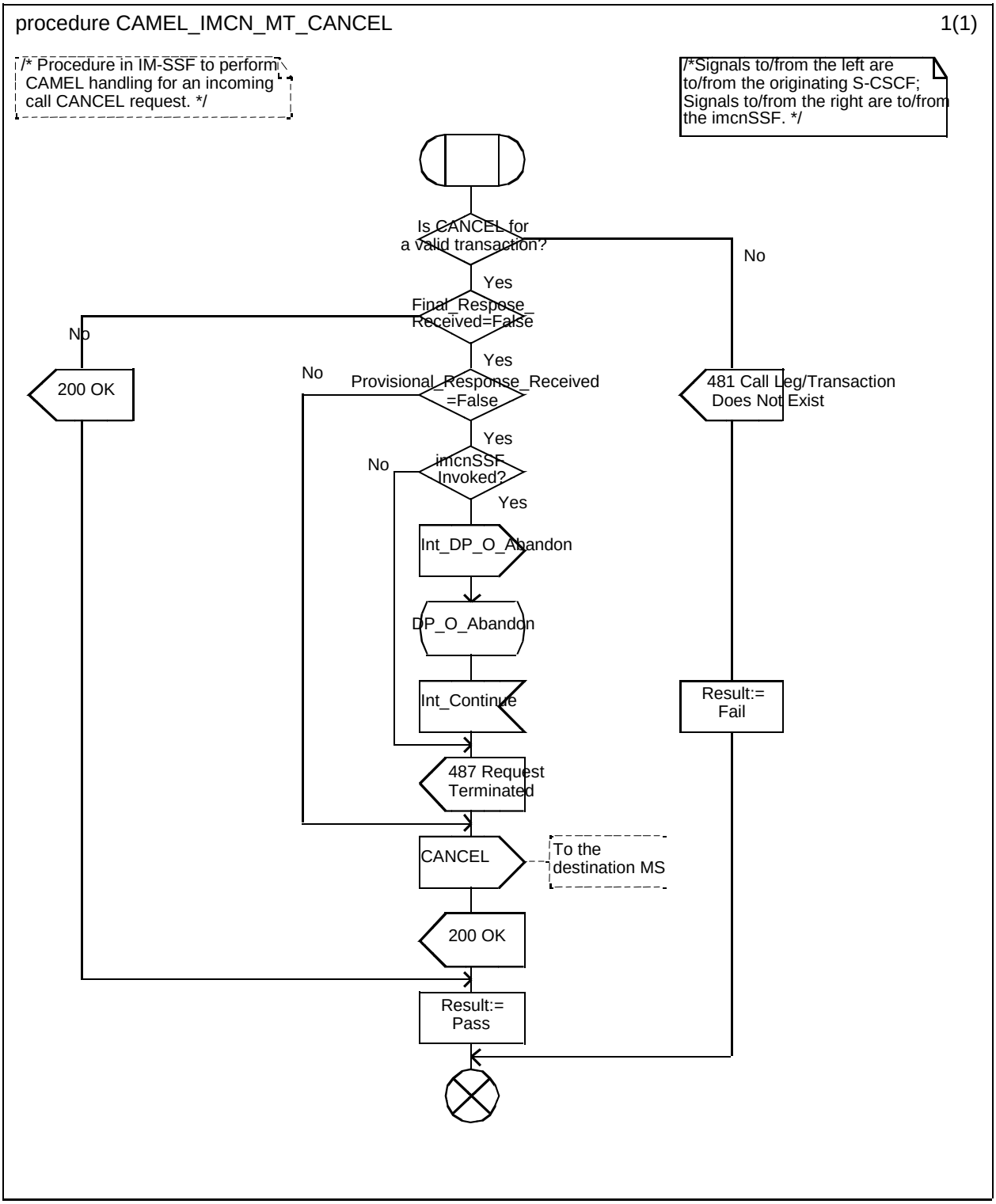

Figure 5.16a: Procedure CAMEL_IMCN_MT_CANCEL (sheet 1)

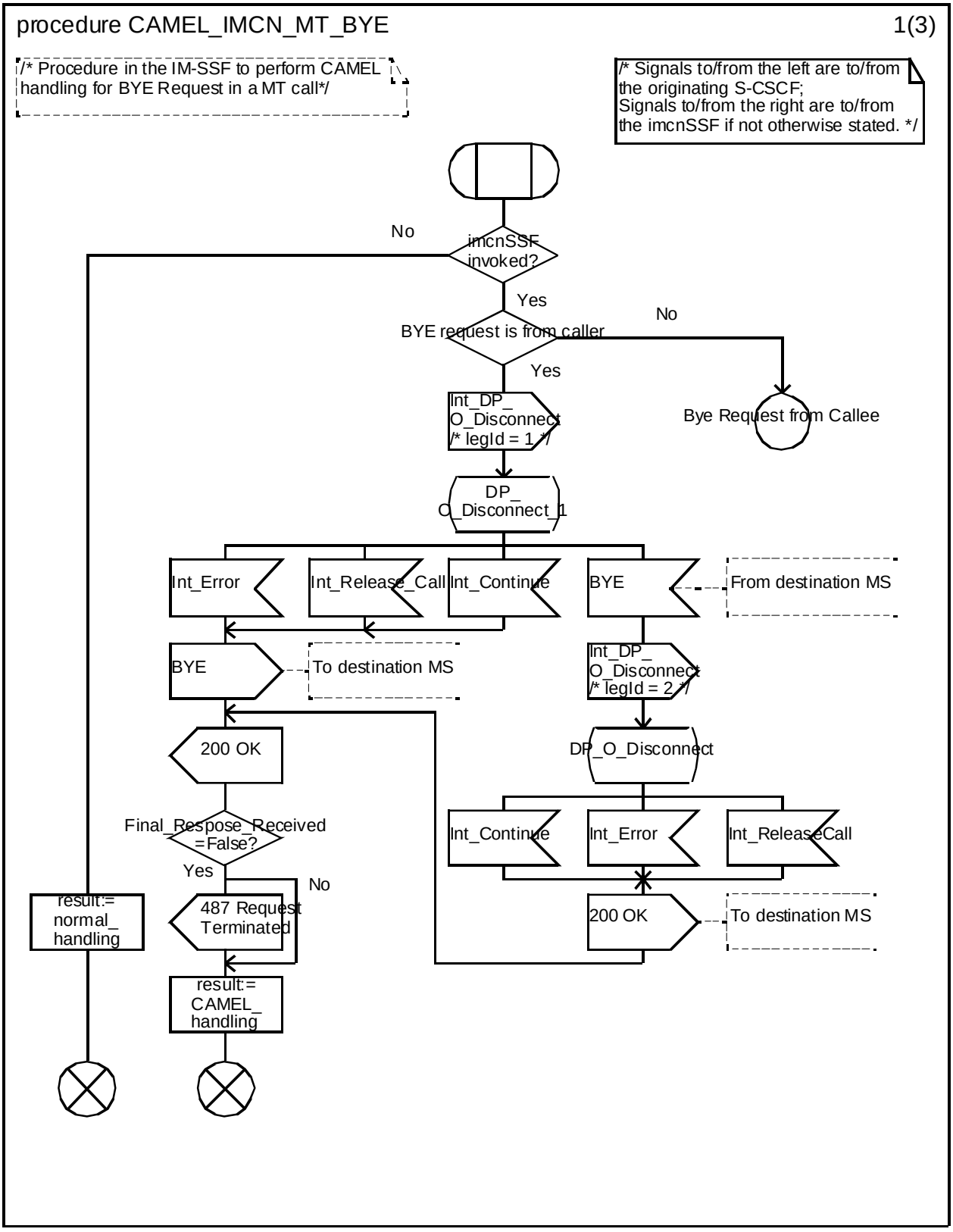

Figure 5.17a: Procedure CAMEL_IMCN_MT_BYE (sheet 1)

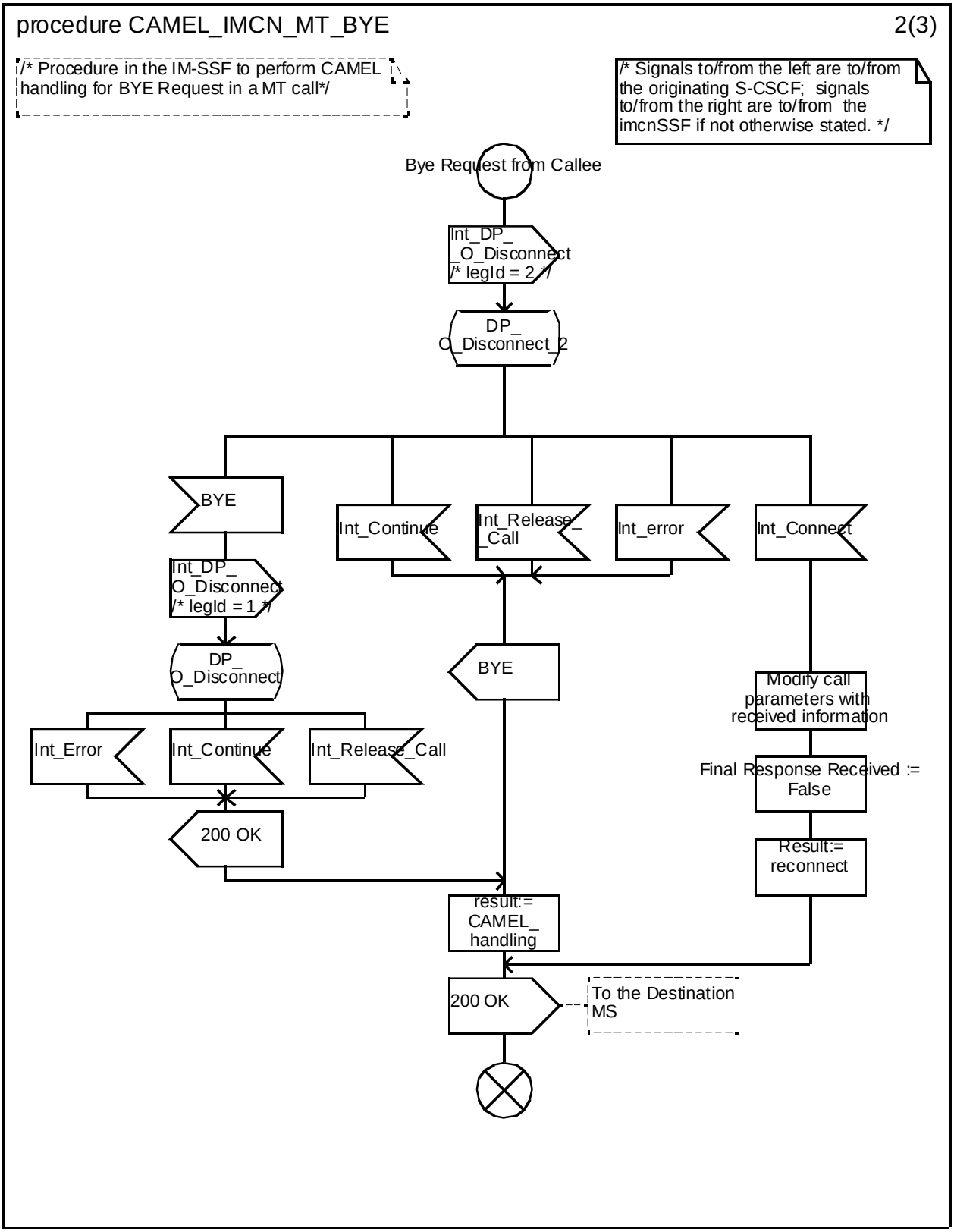

Figure 5.17b: Procedure CAMEL_IMCN_MT_BYE (sheet 2)

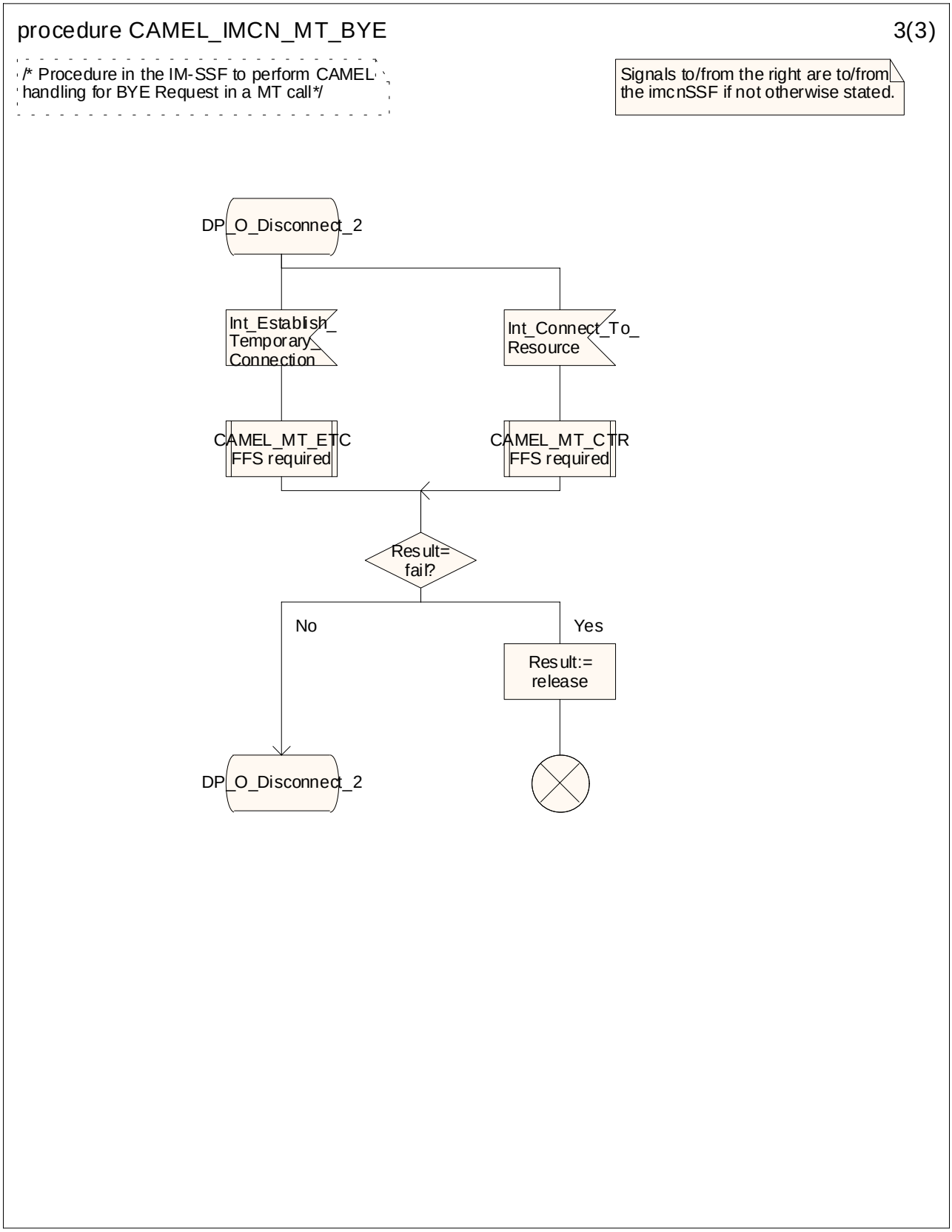

Figure 5.17c: Procedure CAMEL_IMCN_MT_BYE (sheet 3)

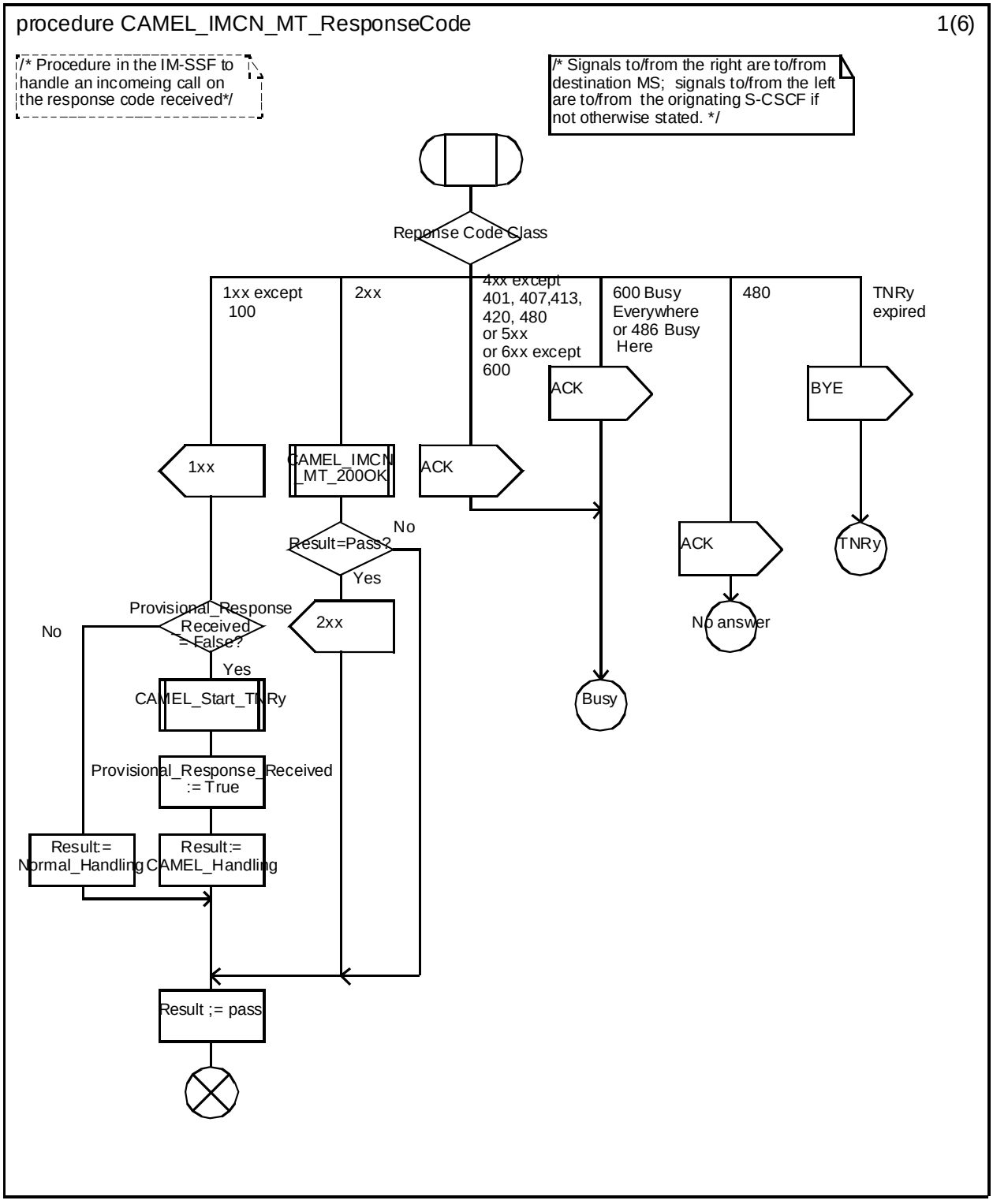

Figure 5.18a: Procedure CAMEL_IMCN_MT_ResponseCode (sheet 1)

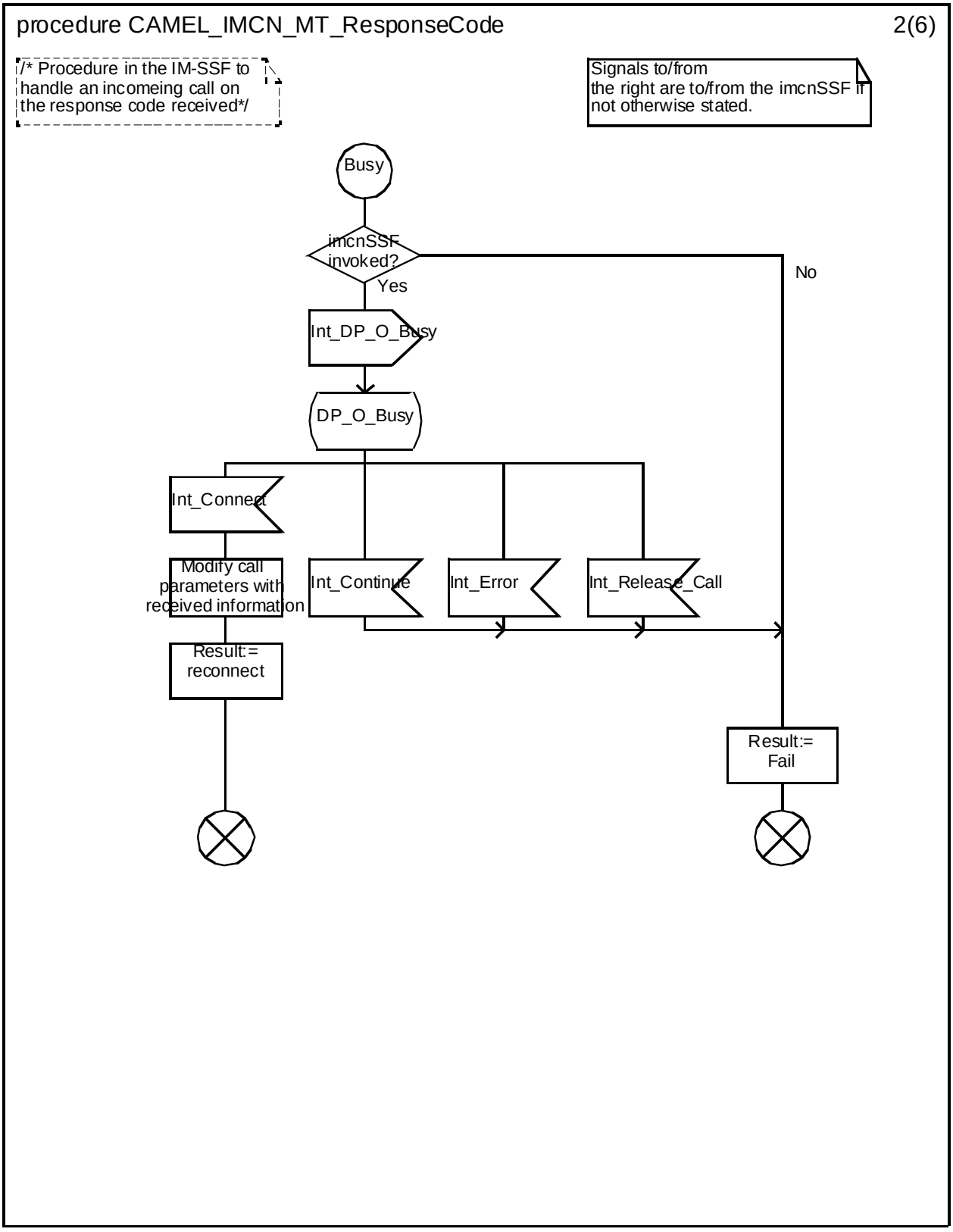

Figure 5.18b: Procedure CAMEL_IMCN_MT_ResponseCode (sheet 2)

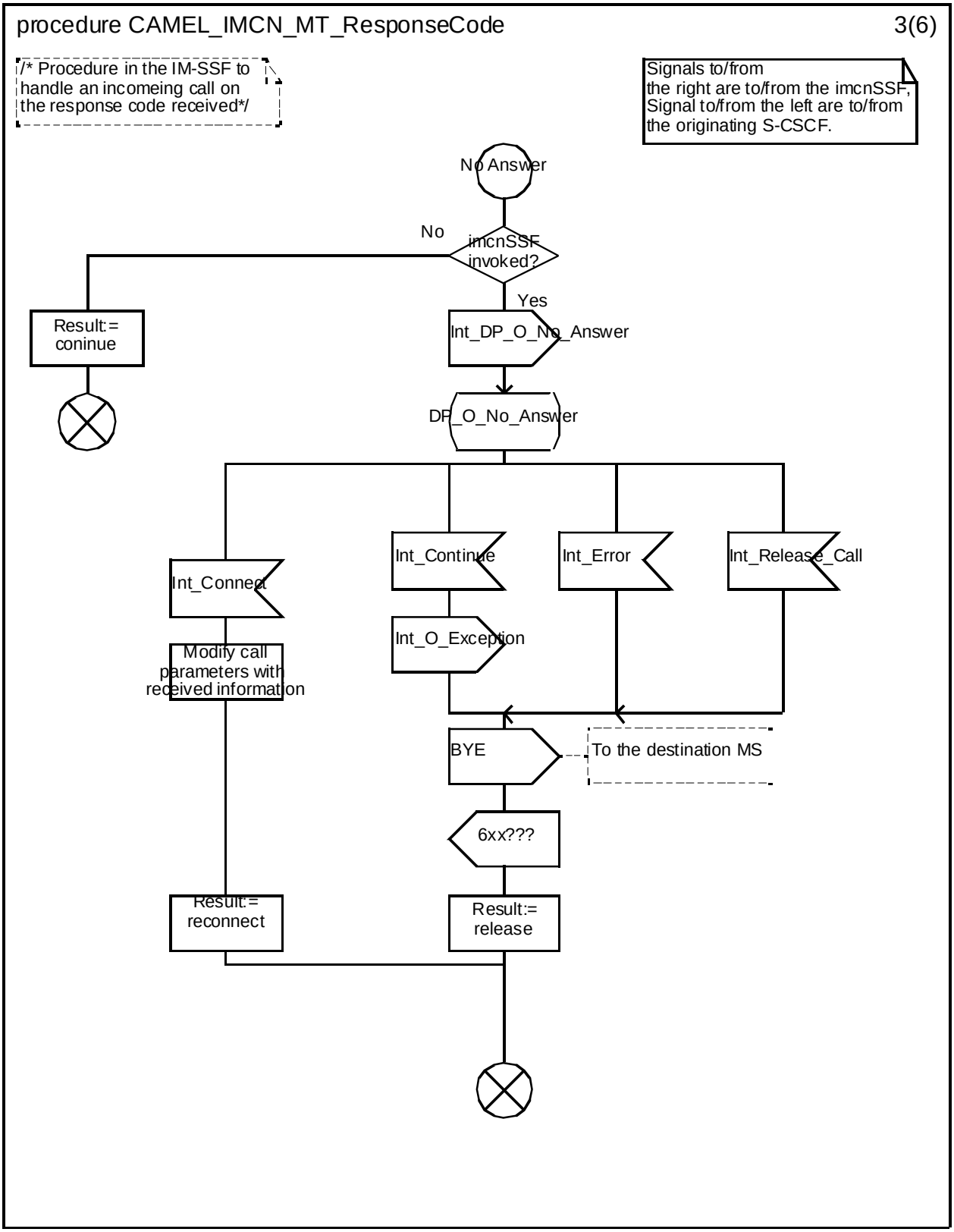

Figure 5.18c: Procedure CAMEL_IMCN_MT_ResponseCode (sheet 3)

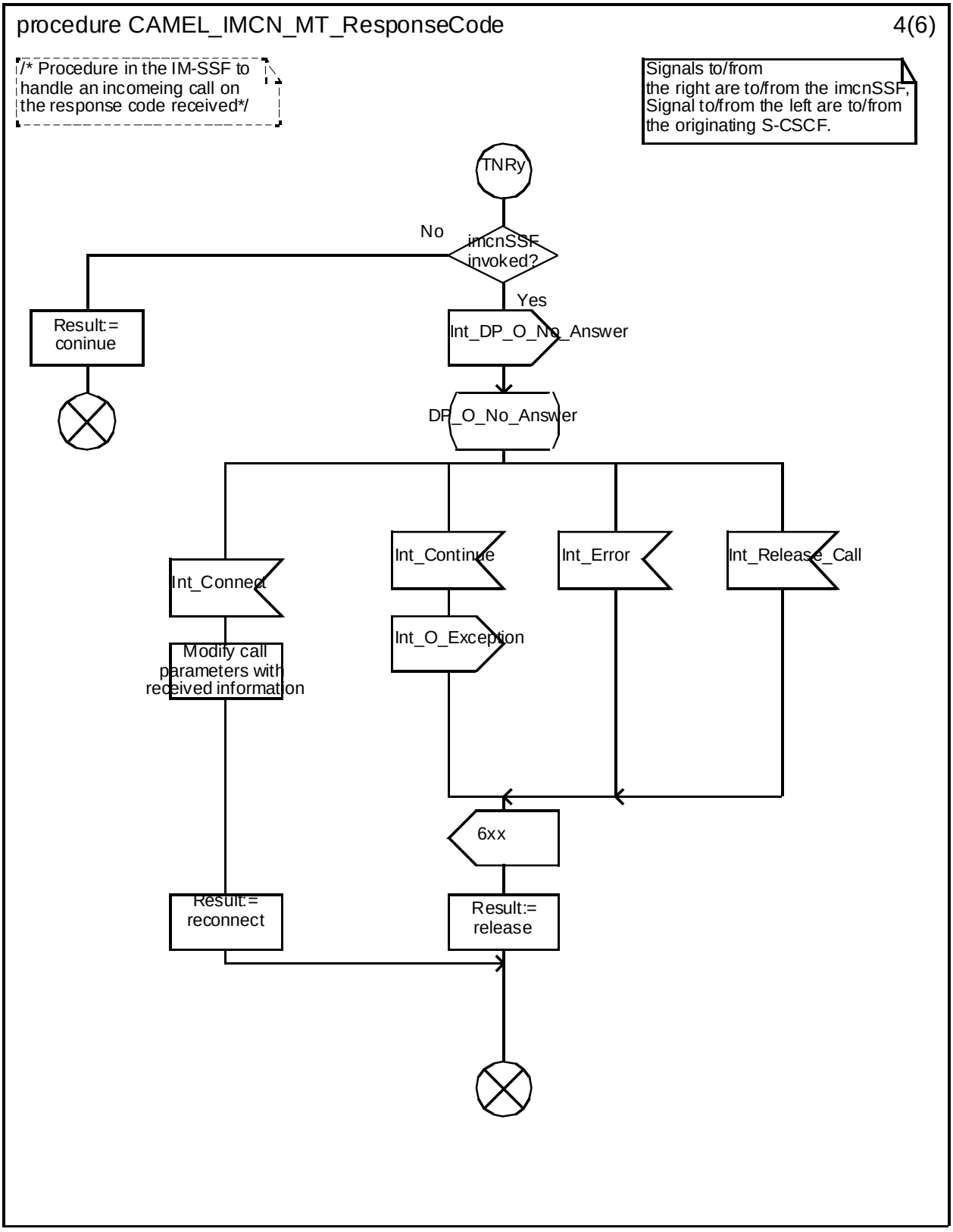

Figure 5.18d: Procedure CAMEL_IMCN_MT_ResponseCode (sheet 4)

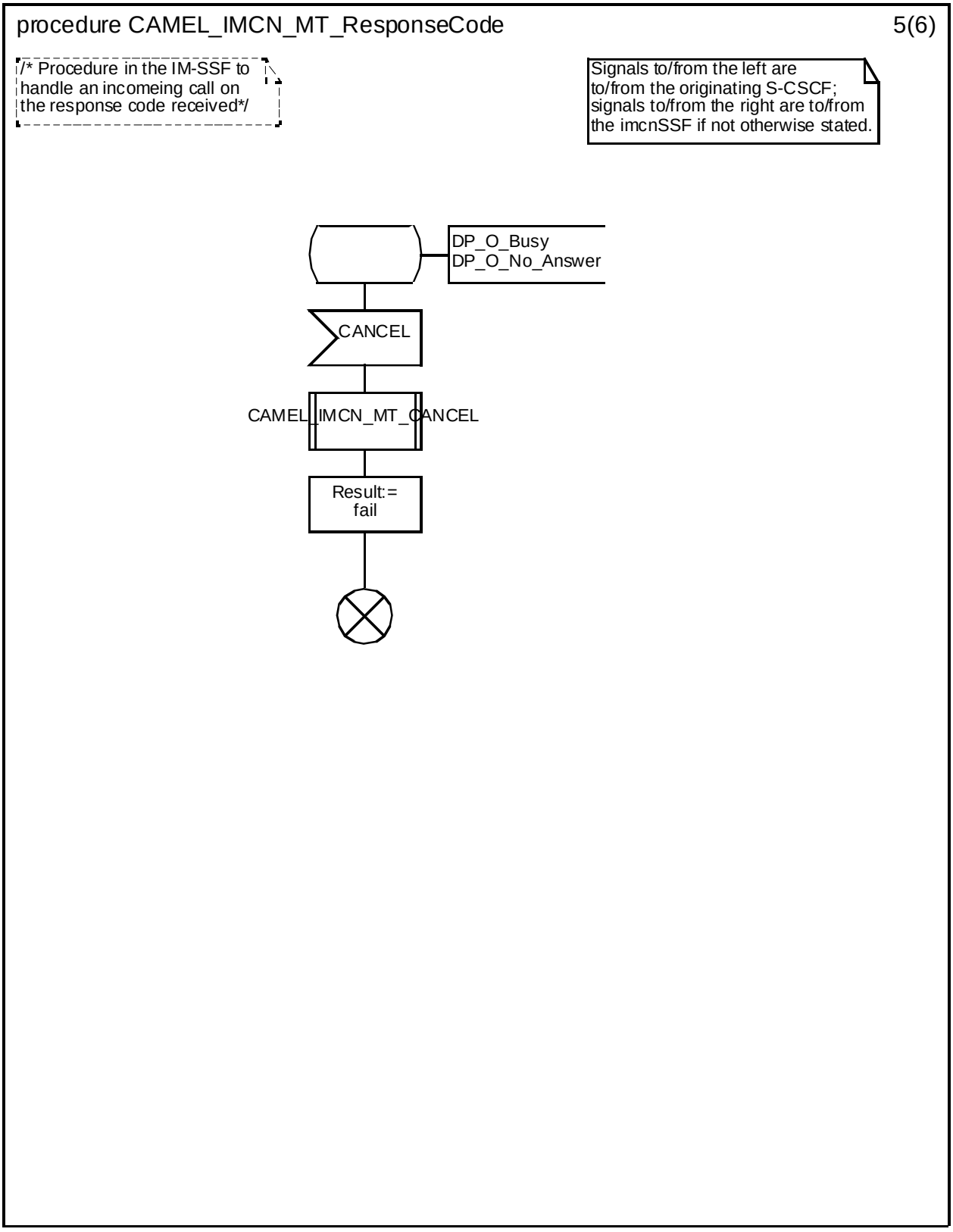

Figure 5.18e: Procedure CAMEL_IMCN_MT_ResponseCode (sheet 5)

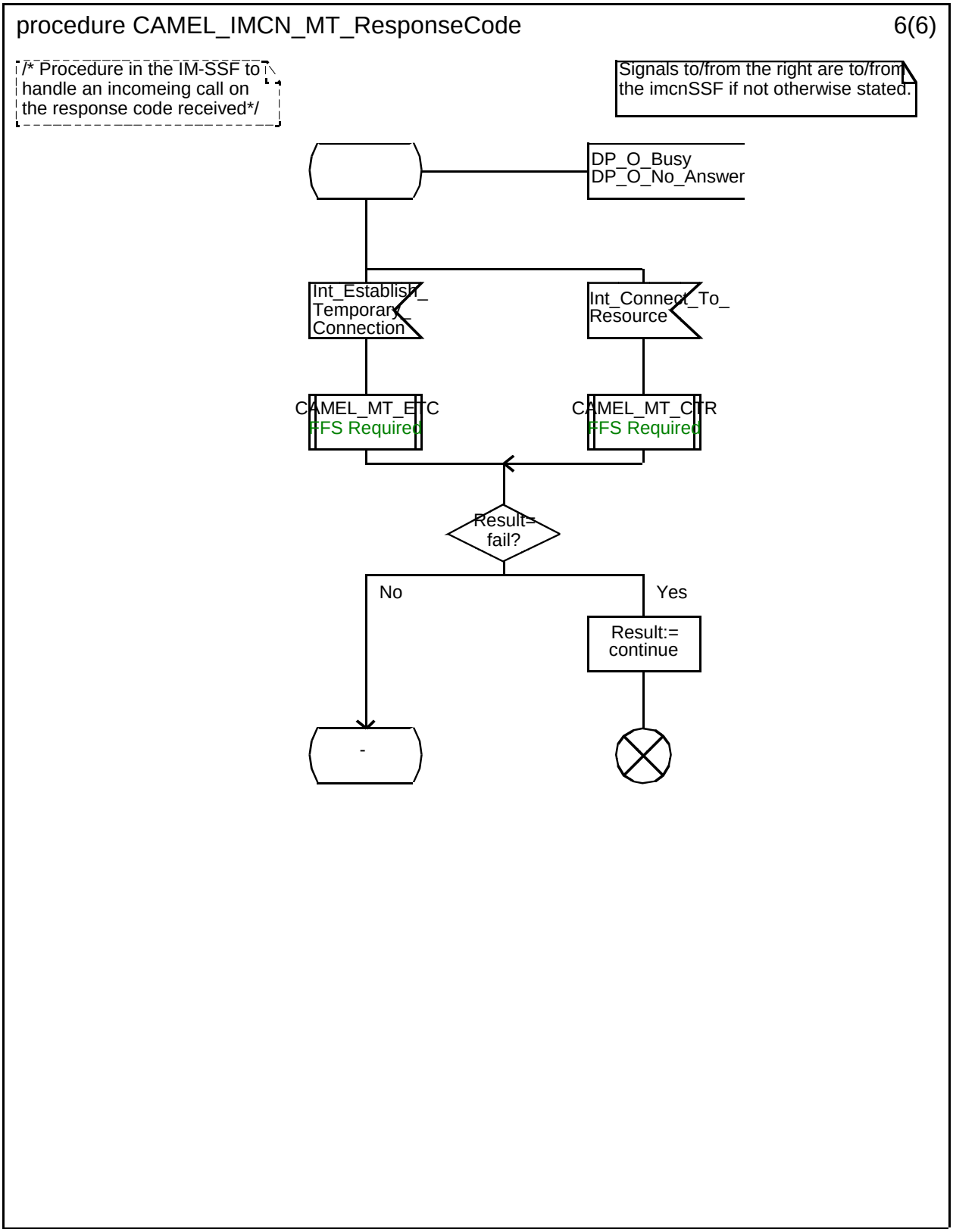

Figure 5.18f: Procedure CAMEL_IMCN_MT_ResponseCode (sheet 6)

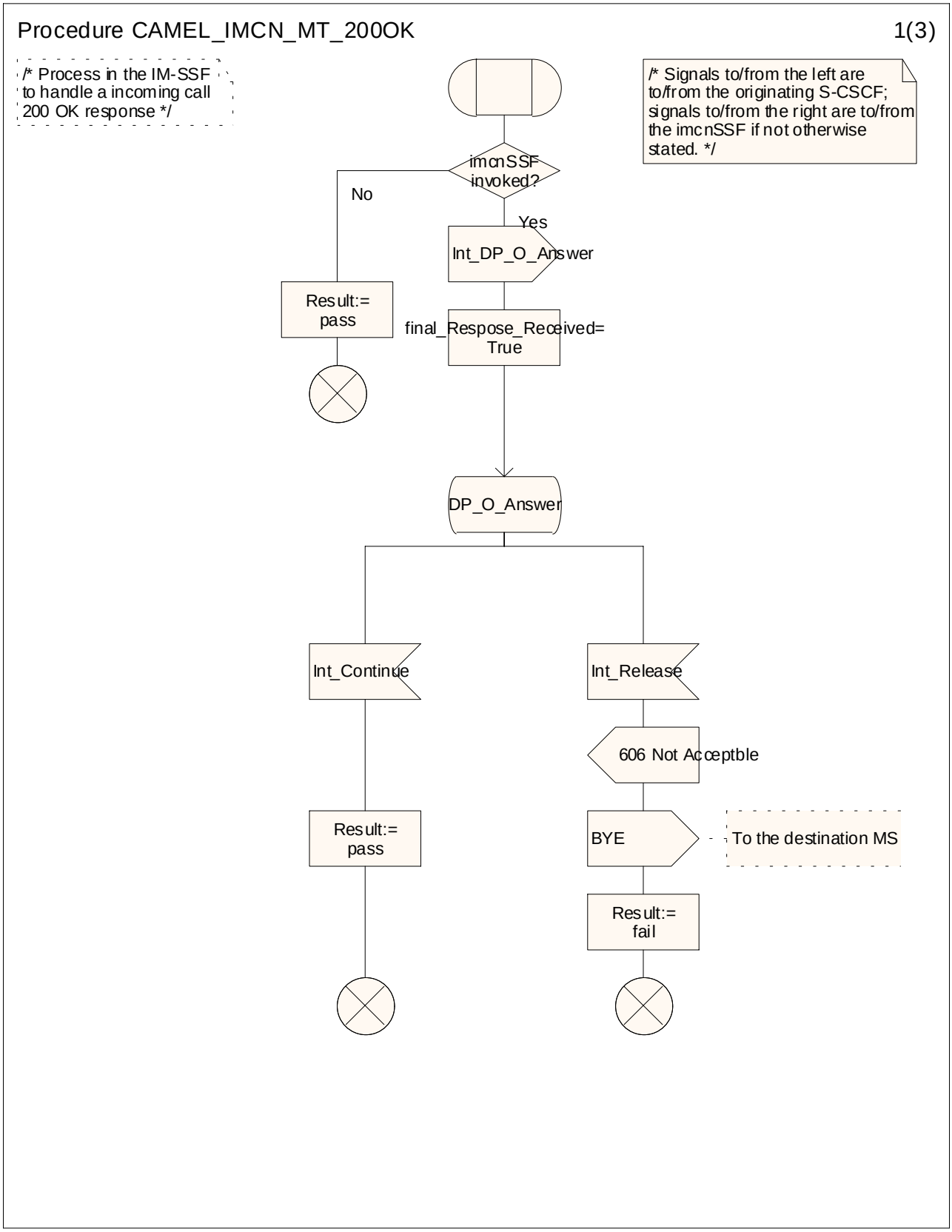

Figure 5.19a: Procedure CAMEL_IMCN_MT_200OK (sheet 1)

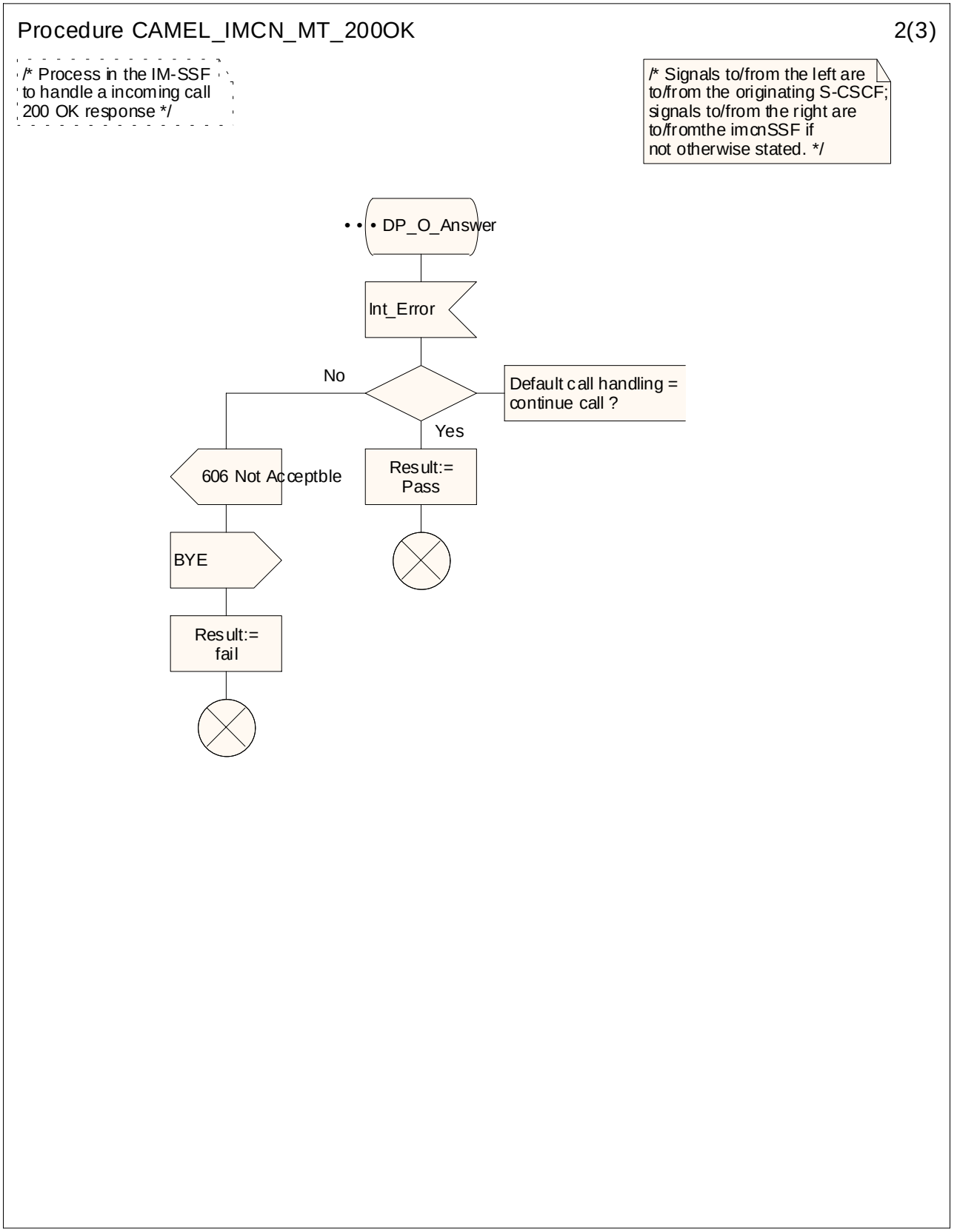

Figure 5.19b: Procedure CAMEL_IMCN_MT_200OK (sheet 2)

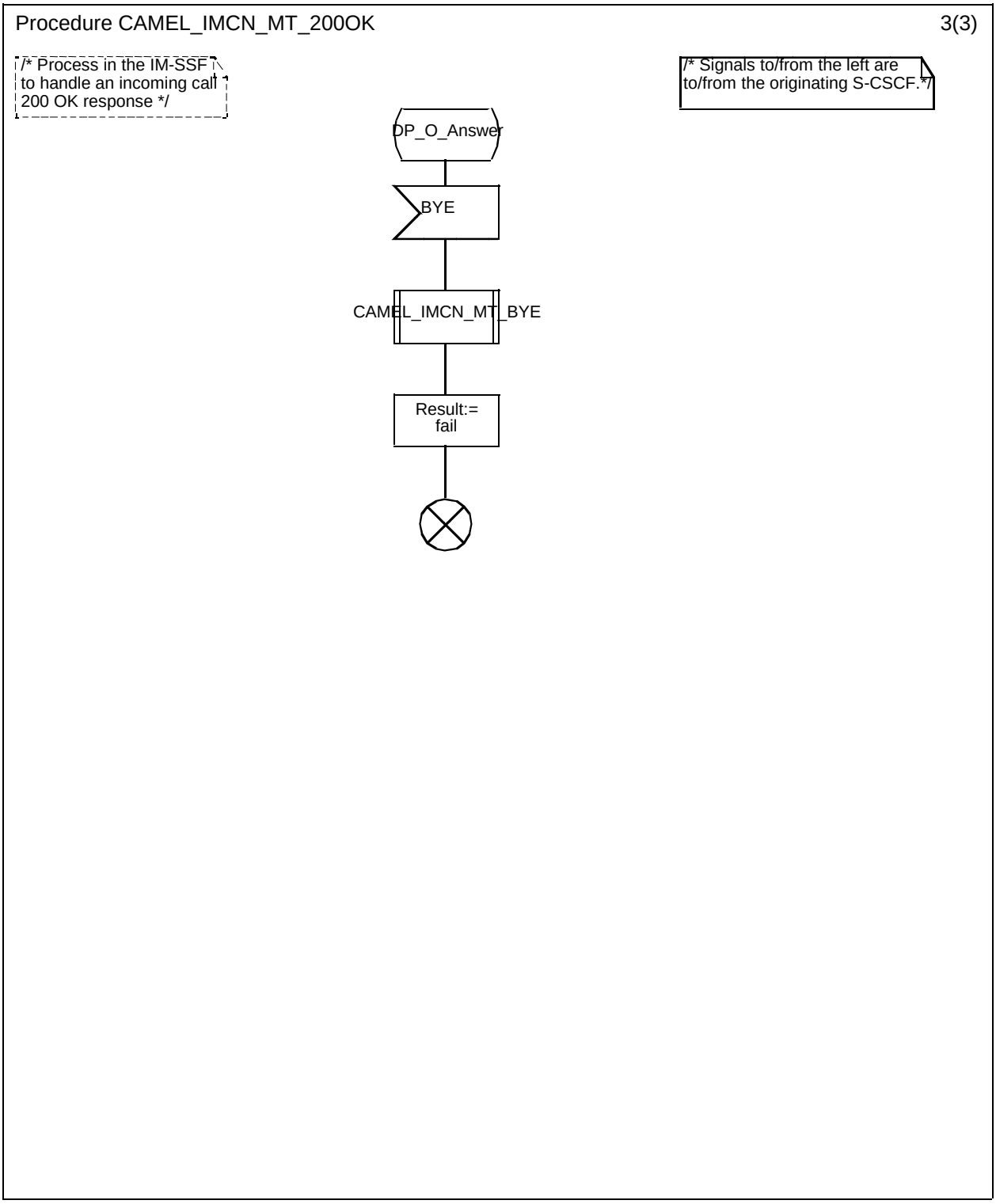

Figure 5.19c: Procedure CAMEL_IMCN_MT_200OK (sheet 3)

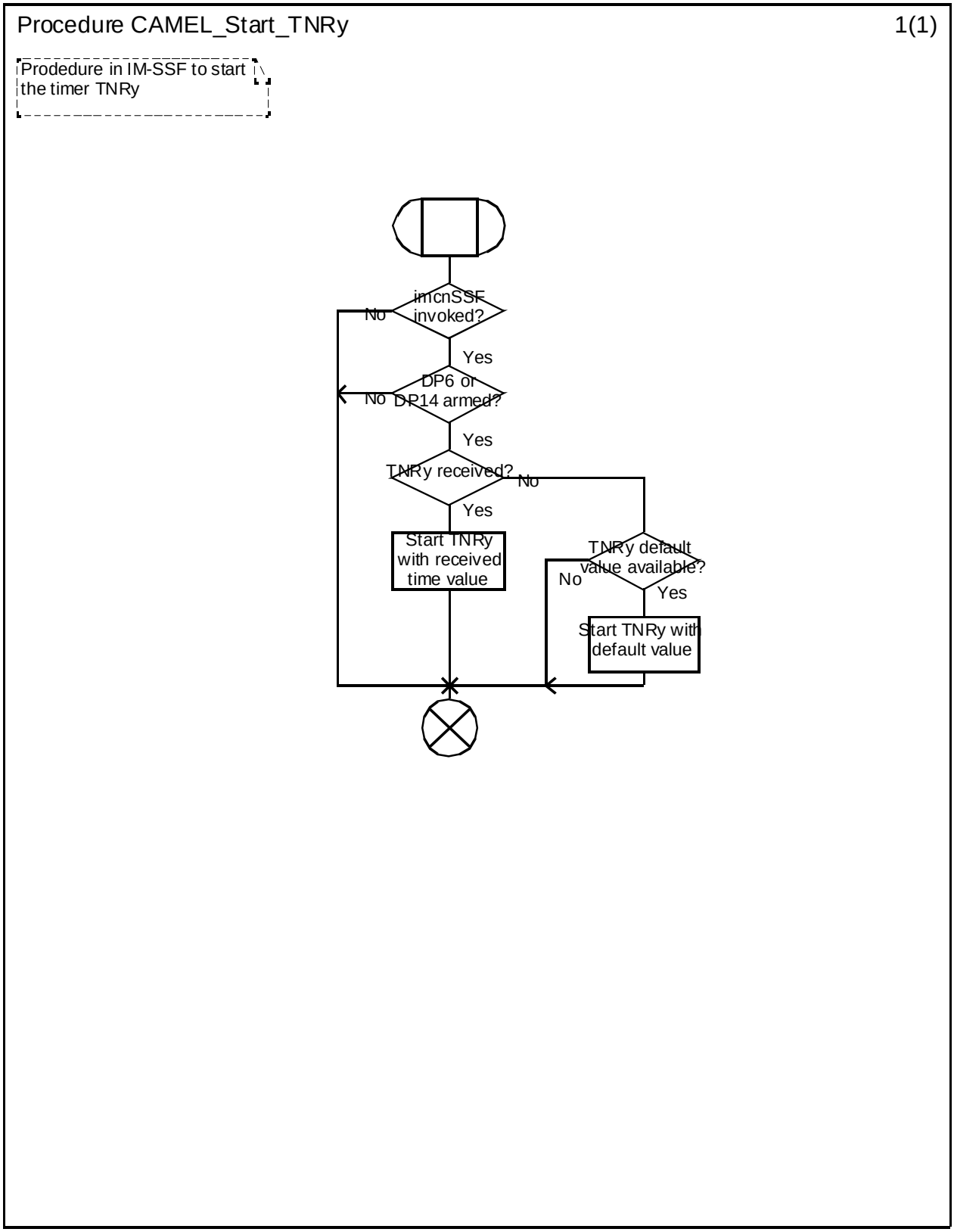

Figure 5.20a: Procedure CAMEL_Start_TNRy (sheet 1)

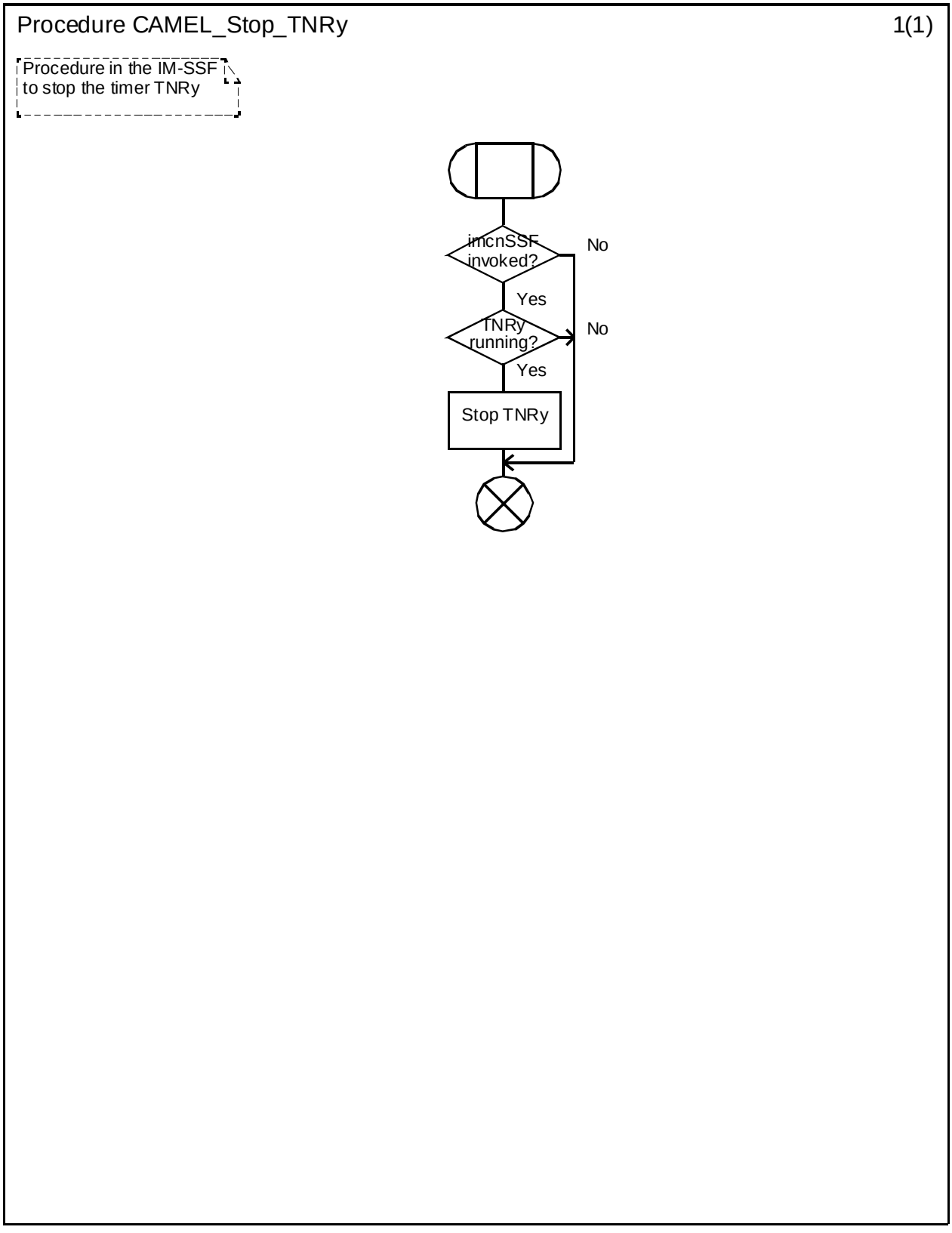

Figure 5.21a: Procedure CAMEL_Stop_TNRy (sheet 1)

5.1.4 Handling of call in the imcnSSF

Handling of mobile calls in the imcnSSF may involve the following process and procedures:

- imcnSSF;
- imcnCheck_Criteria;
- imcnConnect_To_Resource;
- imcnHandle_AC;
- imcnHandle_ACR;
- imcnHandle_CIR;
- imcnHandle_CIR_leg;
- imcnComplete_FCI_record;
- imcnComplete_all_FCI_records;
- imcnHandle_O_AcceptCall;
- imcnHandle_T_AcceptCall.

The detailed error handling for the process imcnSSF and the associated procedures is specified in 3GPP TS 29.278.

5.1.4.1 Behaviour of the imcnSSF in the process imcnSSF

5.1.4.2 Process imcnSSF and procedures

Process imcnSSF 1(33)

/* Invocation of imcnSSF in MO, MT call case. */

/* Timers used in the imcnSSF process:

Tssf: Application timer in the ssf.
Tcp: Timer for call period.
This timer measures the duration of a call period.
Tsw: Timer for tariff switch.
At the expiration of this timer, a new tariff switch shall be started.
Tw: Warning timer.
At the expiration of this timer, a warning tone shall be played to the calling party.
DELTA: time, measured in the imcnSSF, elapsed between the time an ApplyChargingReport operation is send to the imcnSCF and an ApplyCharging operation is received from the imcnSCF.
Tccd: Control of call duration timer.
This timer supervises if after sending of ACR a new AC is received.
Tccd has a value range of 1 to 20 seconds.

Ranges for the default values for Tssf.
- non user interaction Tssf timer value: 1 second to 20 seconds
- user interaction Tssf timer value: 1 minute to 30 minutes
*/

/* TASK definition:
The sending of an Application_Begin signal opens a new relationship to the imcnSCF.
The sending of an Application_End or Abort signal terminates the relationship to the imcnSCF.
*/

/* Decision box definitions (1)

'armed TDPs for this CSI?'
It is questioned whether or not the ongoing call can encounter further TDPs which are indicated in the current CSI.

'Call to be released?'
It is questioned whether or not the ongoing call will be released imediately after imcnSSF has responded; that is the ongoing call will not send any signals furtheron to the imcnSSF.
NOTE: In this case the imcnSSF shall also go to idle.

*/

/* Decision box definitions (2)
Thefollowing decisions are used by procedures in CCF:

'imcnSSF invoked?'
Is the imcnSSF process in any state other than Idle?

*/

Figure 5.22a: Process imcnSSF (sheet 1)

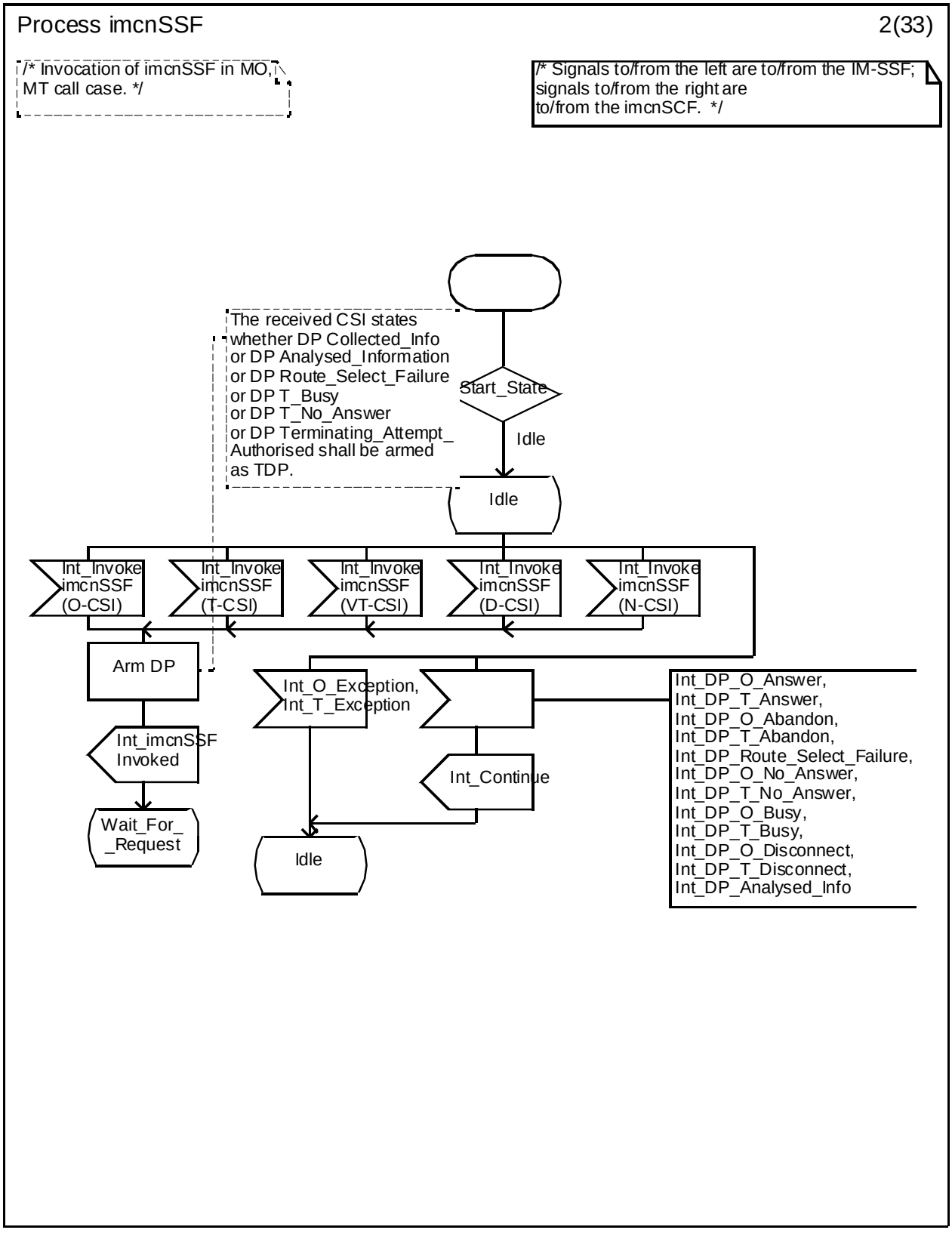

Figure 5.22b: Process imcnSSF (sheet 2)

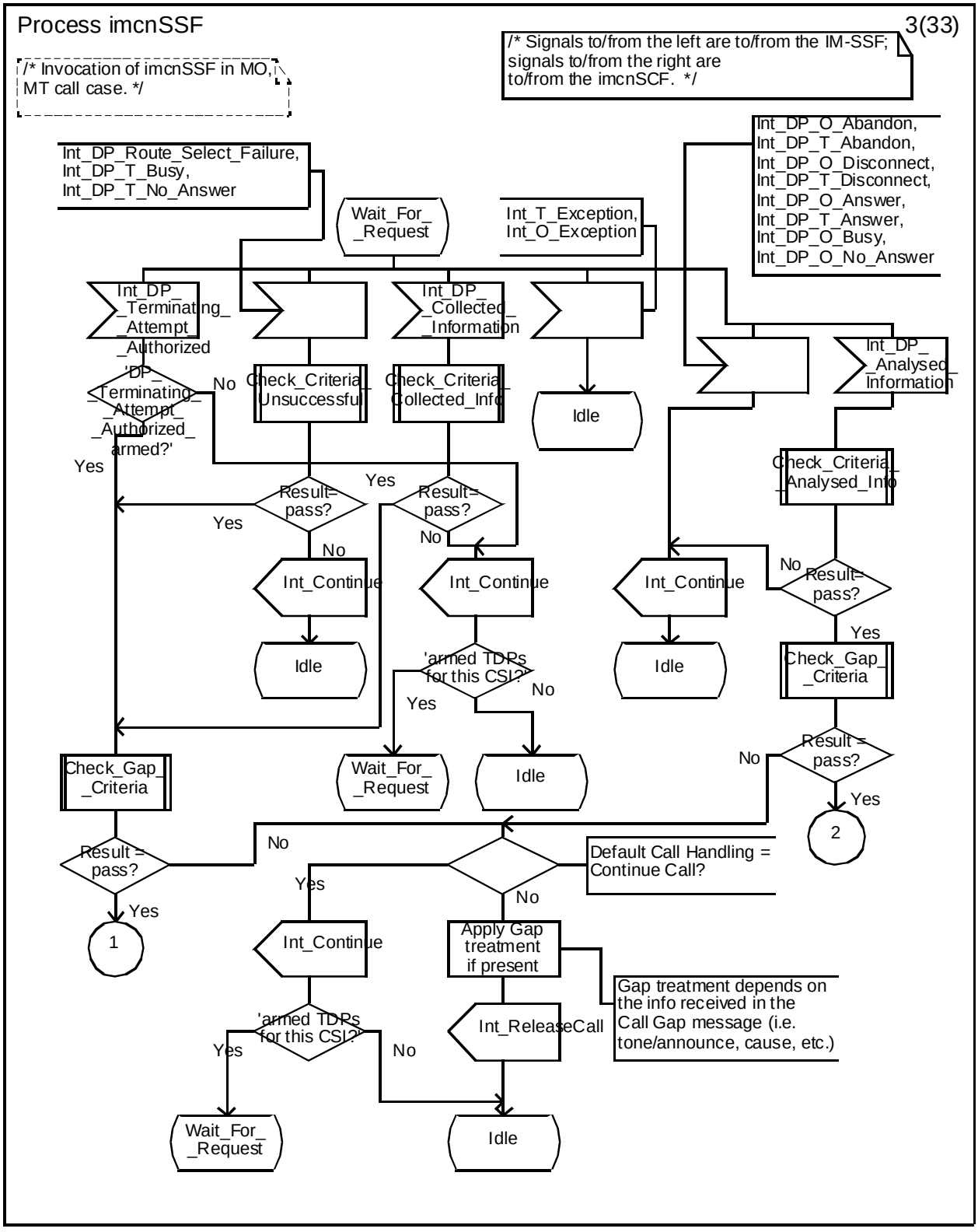

Figure 5.22c: Process imcnSSF (sheet 3)

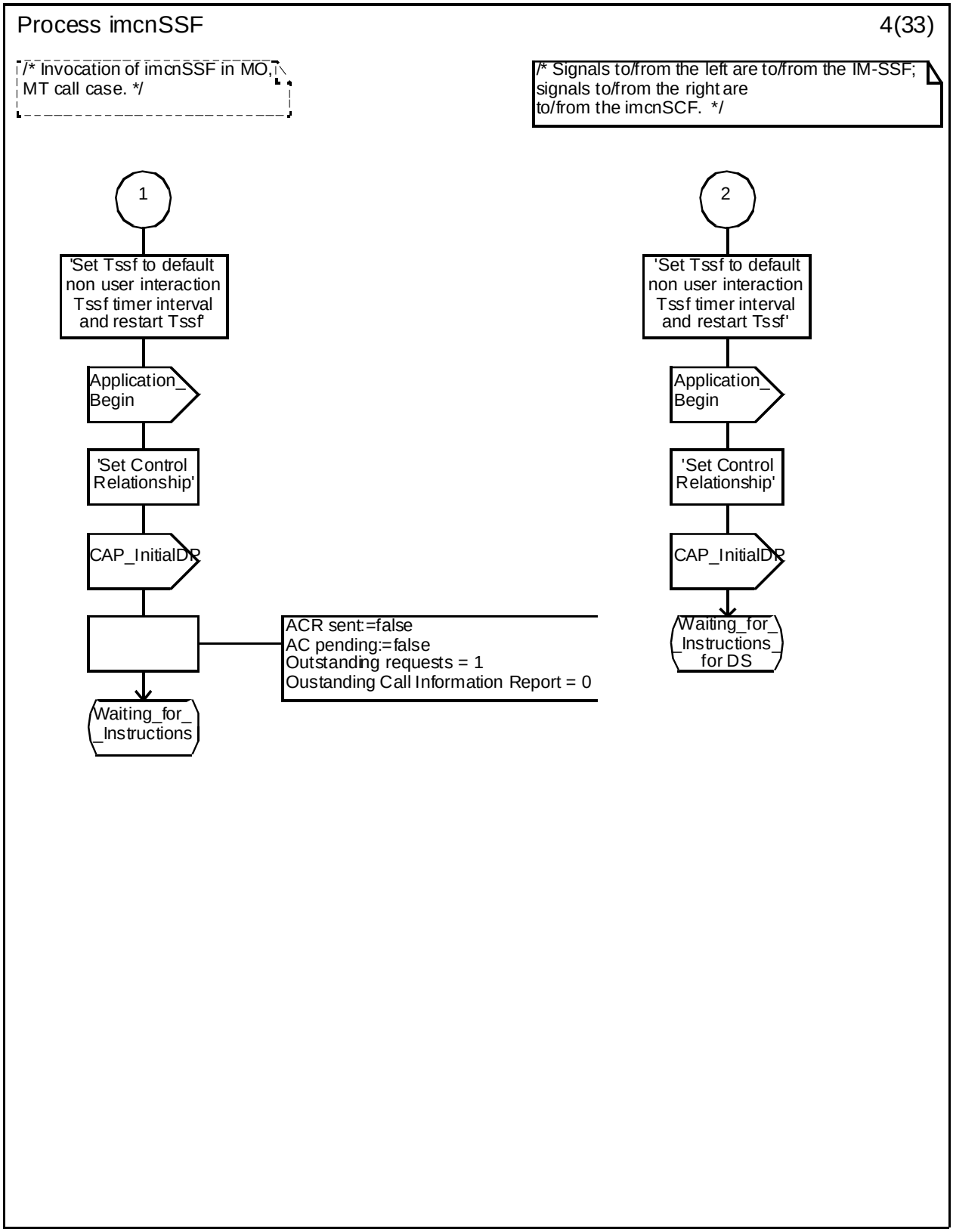

Figure 5.22d: Process imcnSSF (sheet 4)

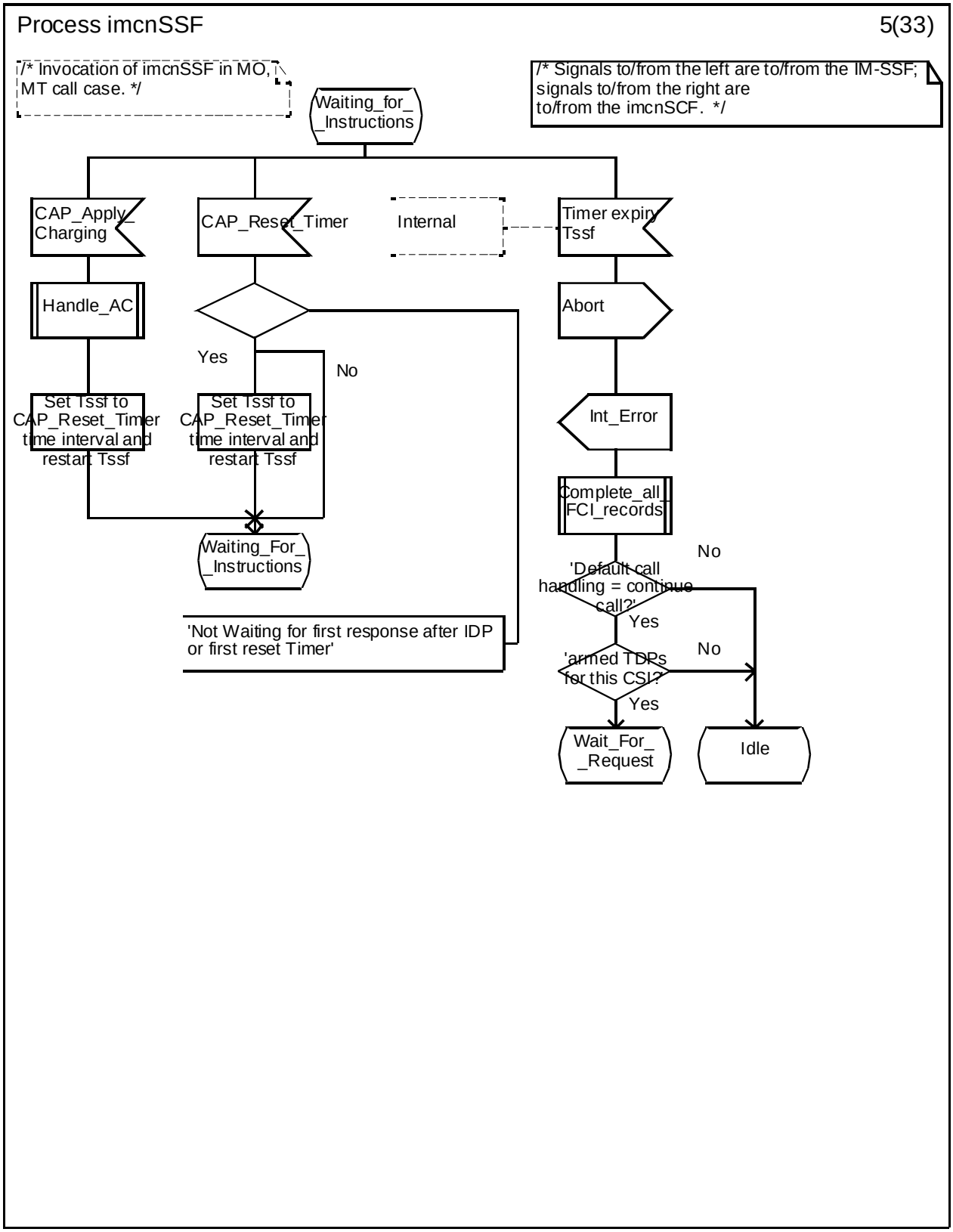

Figure 5.22e: Process imcnSSF (sheet 5)

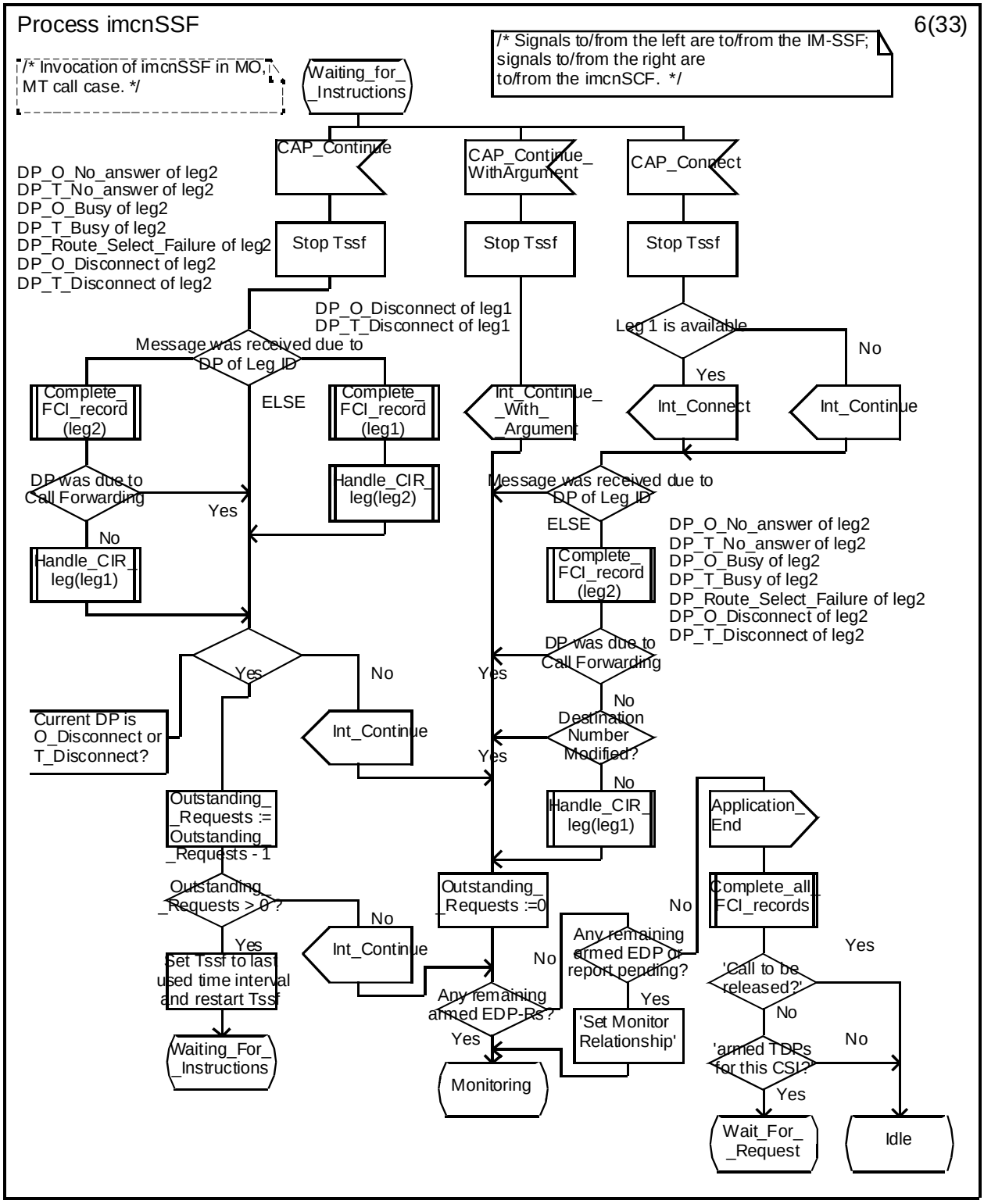

Figure 5.22f: Process imcnSSF (sheet 6)

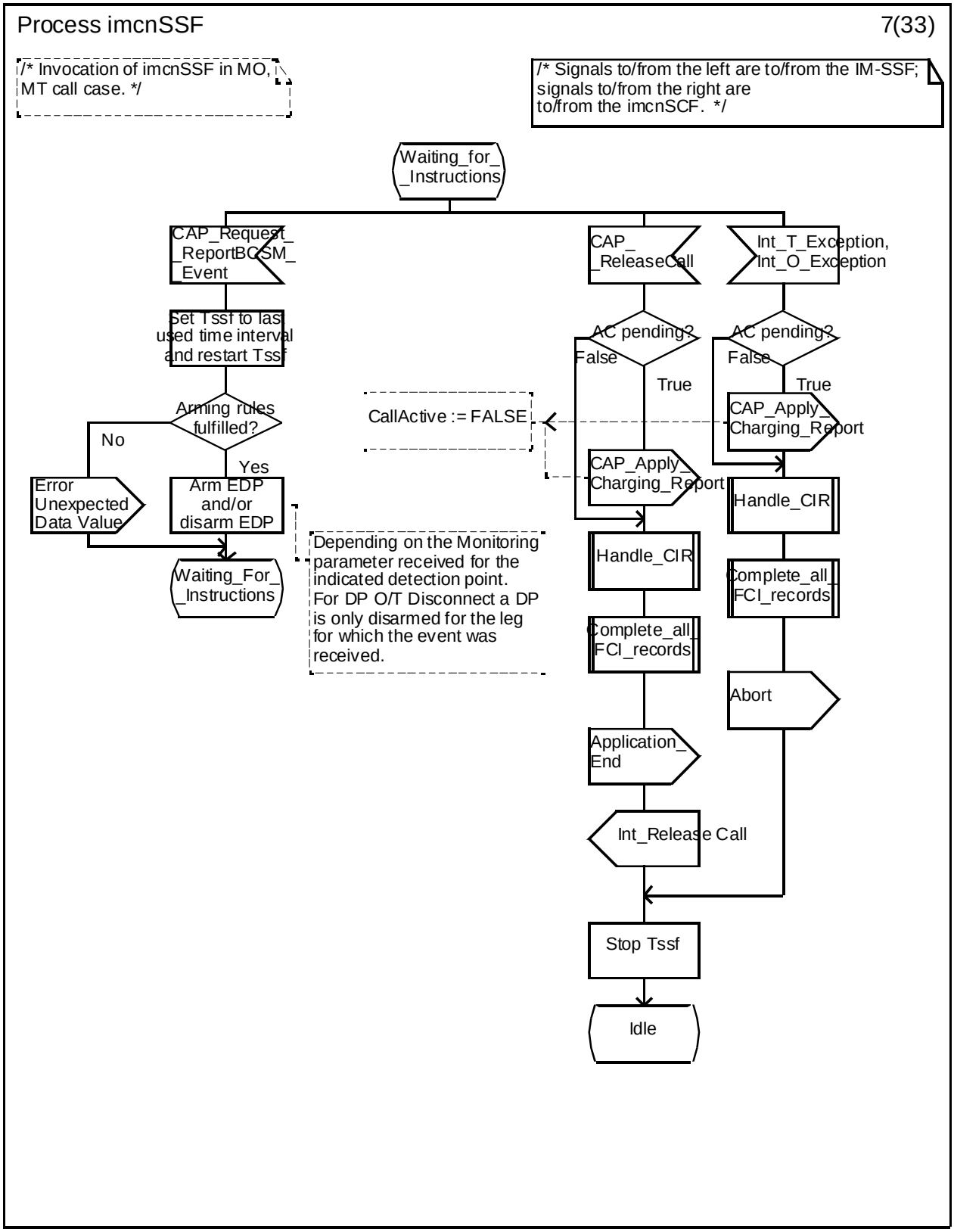

Figure 5.22g: Process imcnSSF (sheet 7)

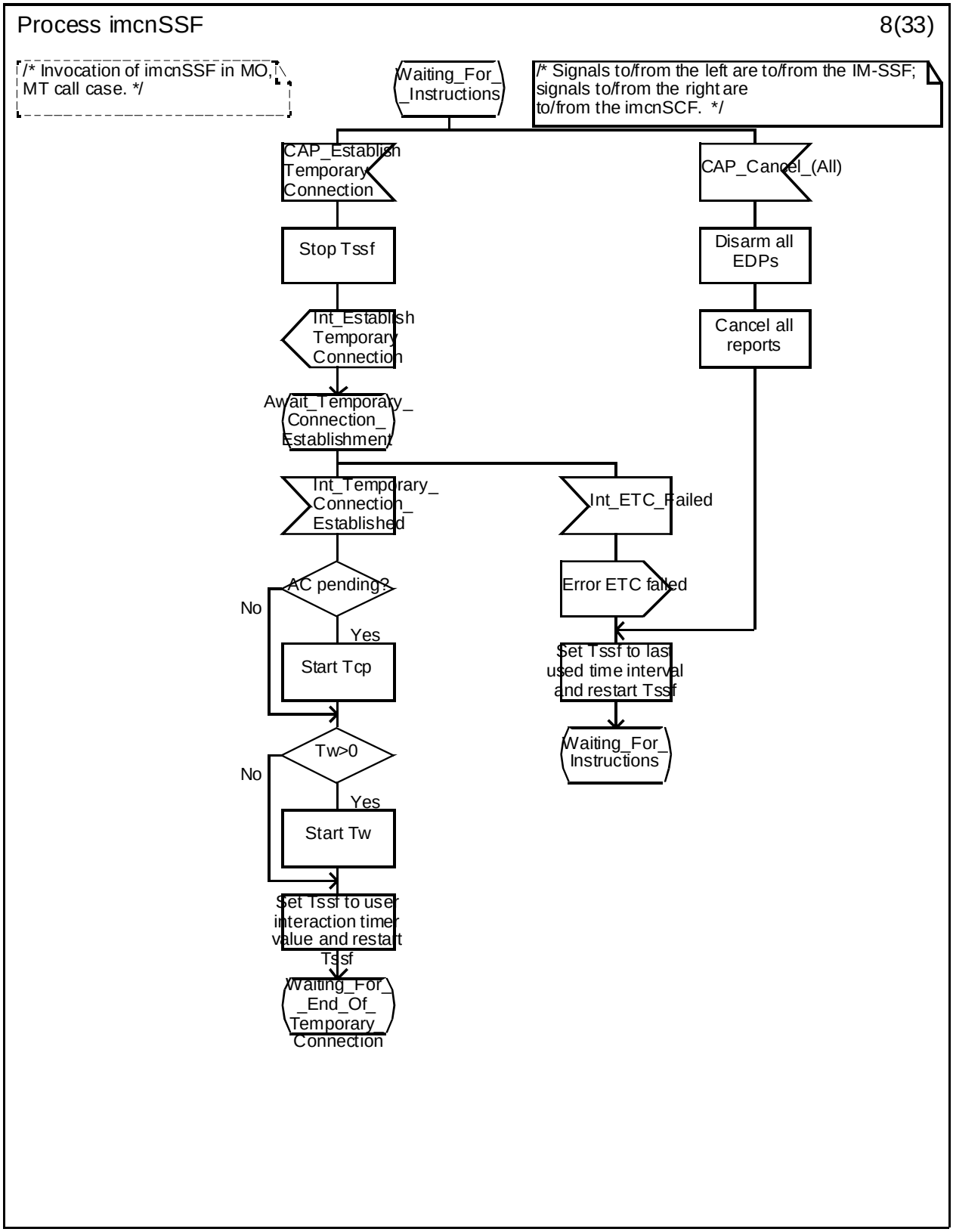

Figure 5.22h: Process imcnSSF (sheet 8)

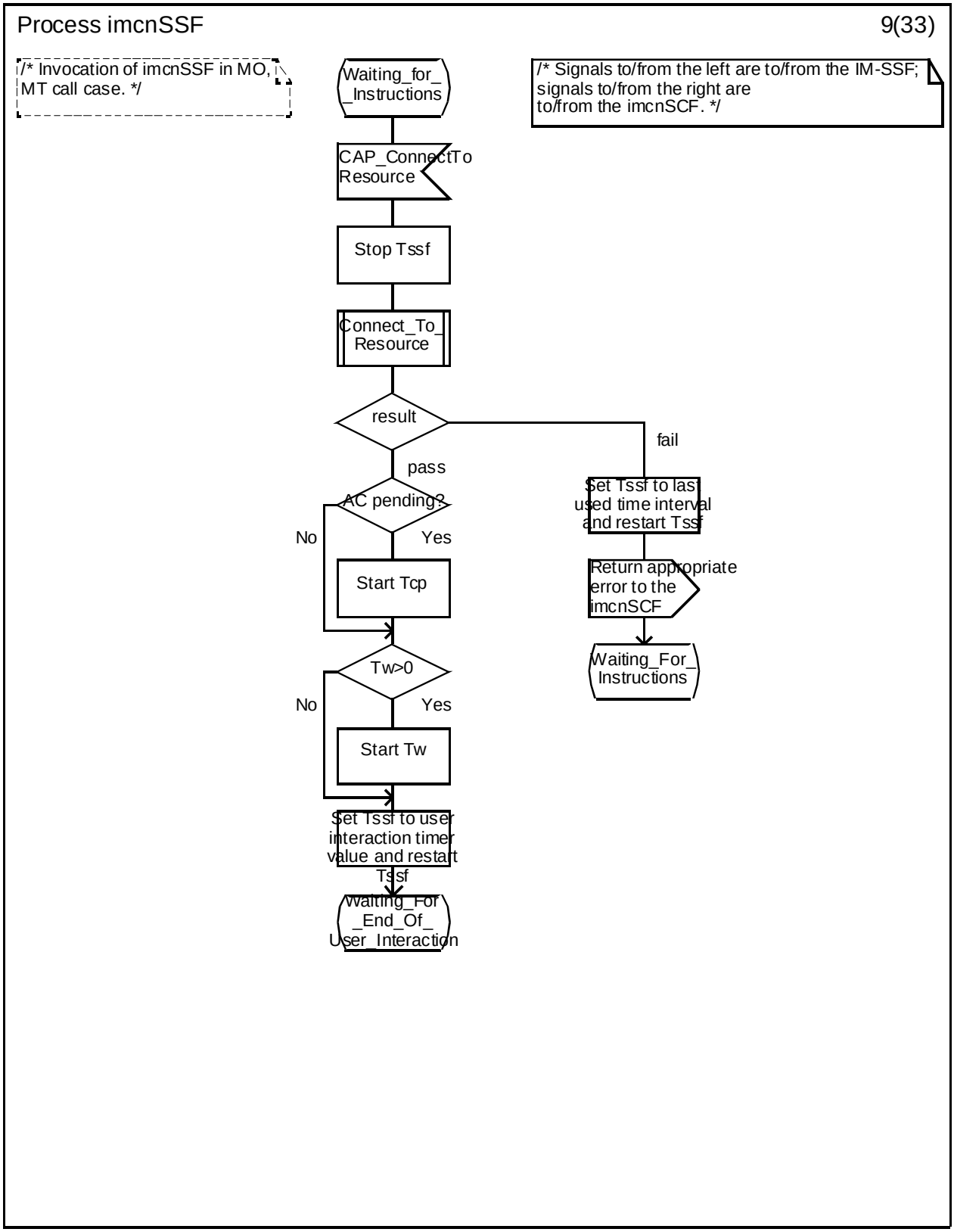

Figure 5.22i: Process imcnSSF (sheet 9)

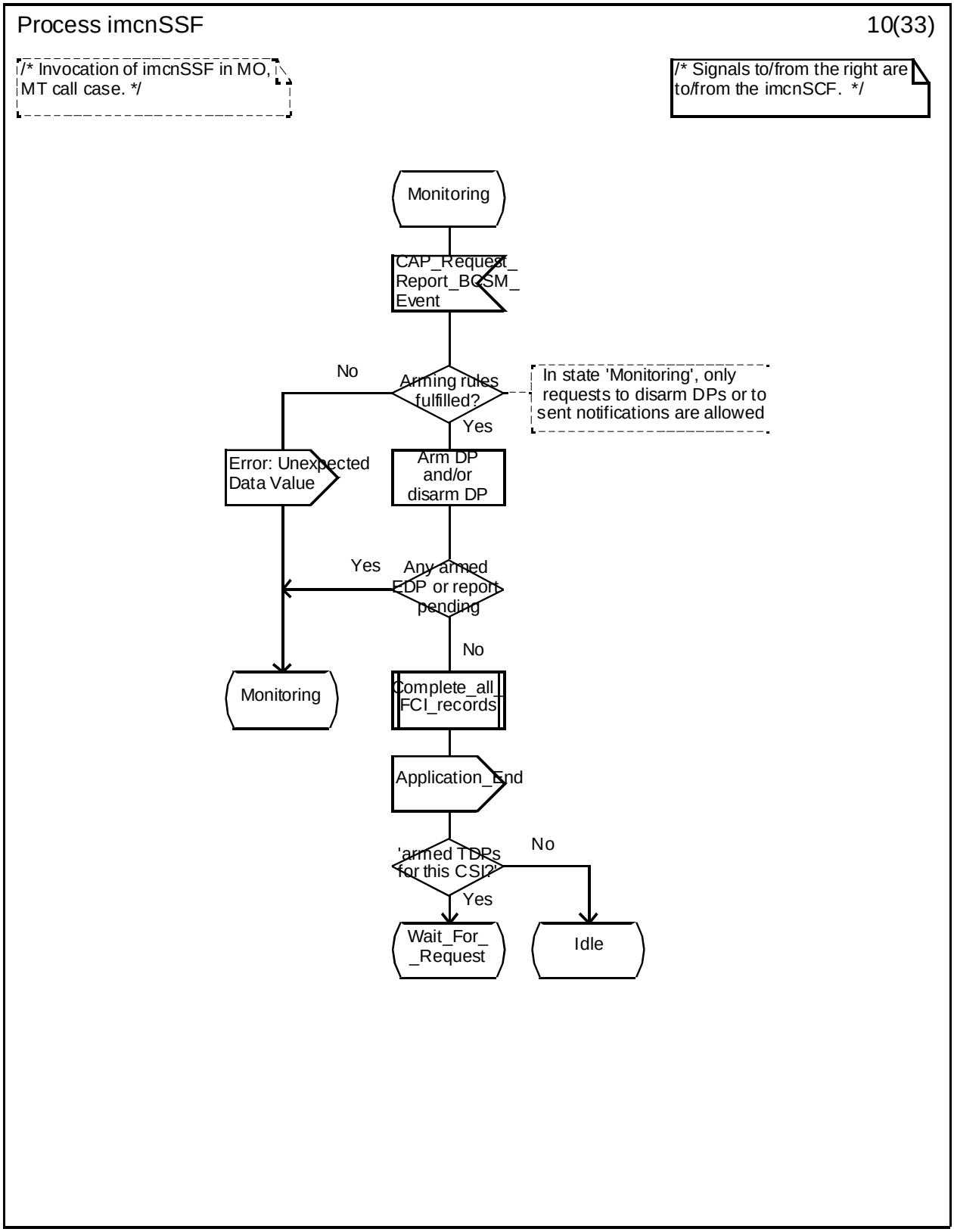

Figure 5.22j: Process imcnSSF (sheet 10)

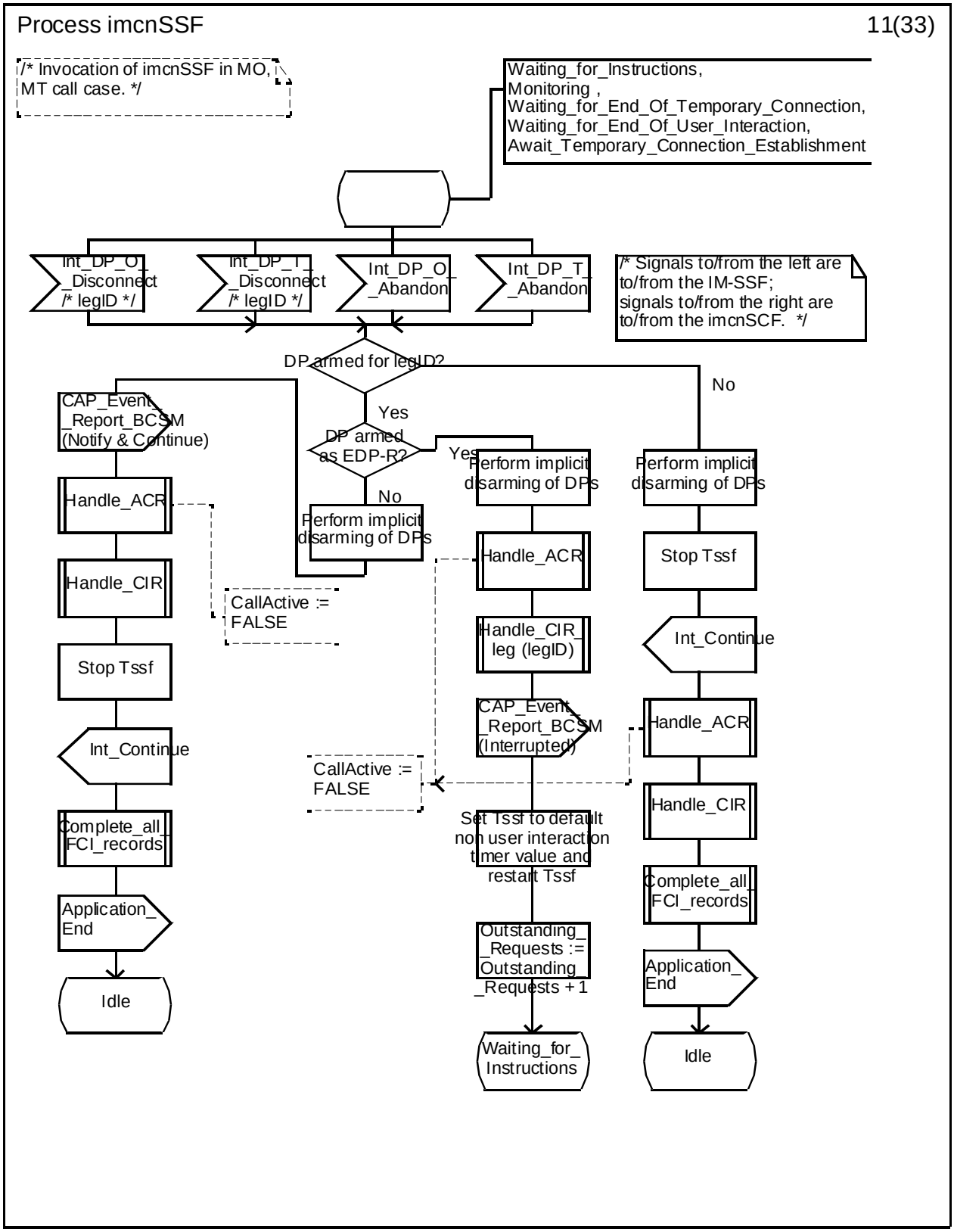

Figure 5.22k: Process imcnSSF (sheet 11)

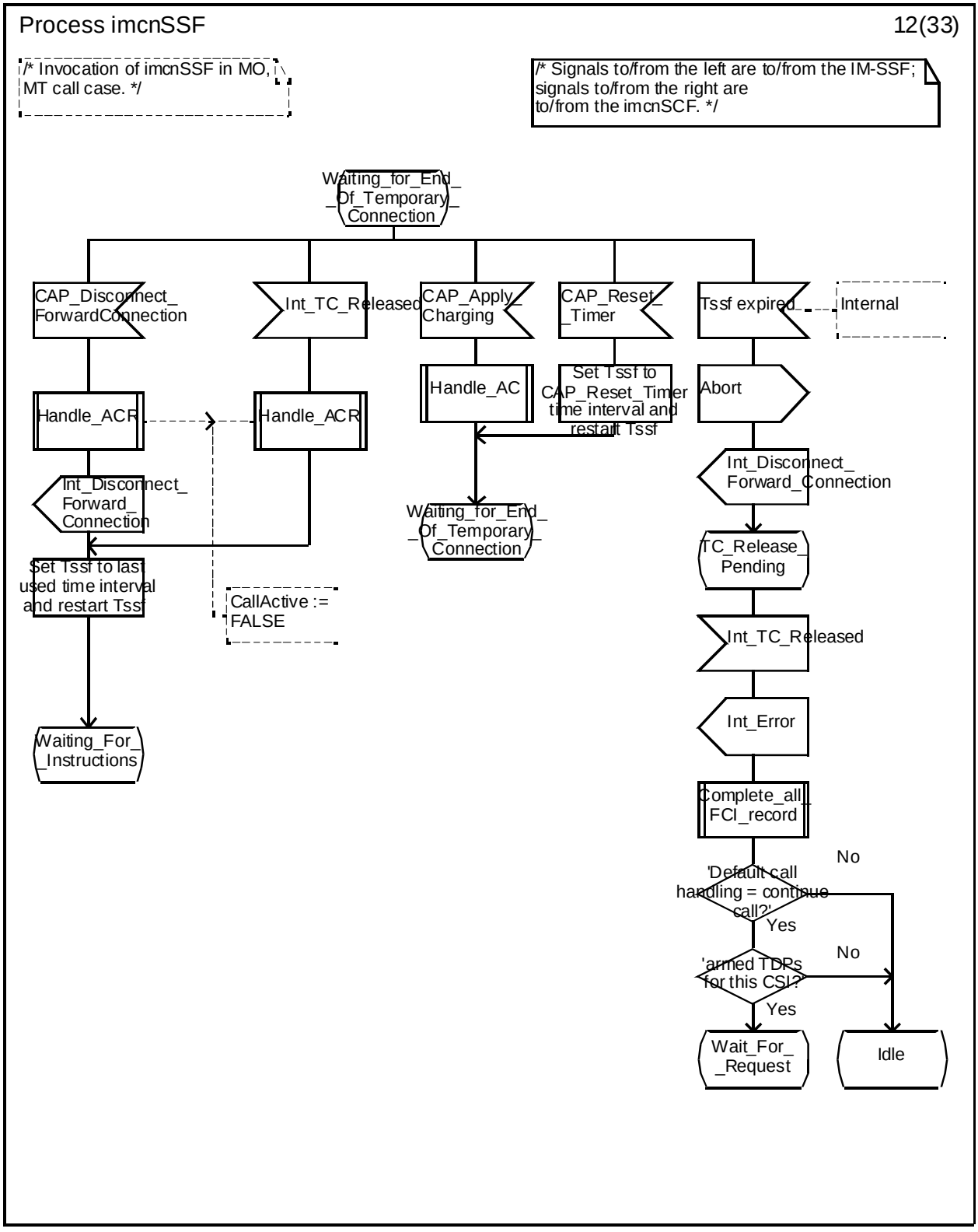

Figure 5.22l : Process imcnSSF (sheet 12)

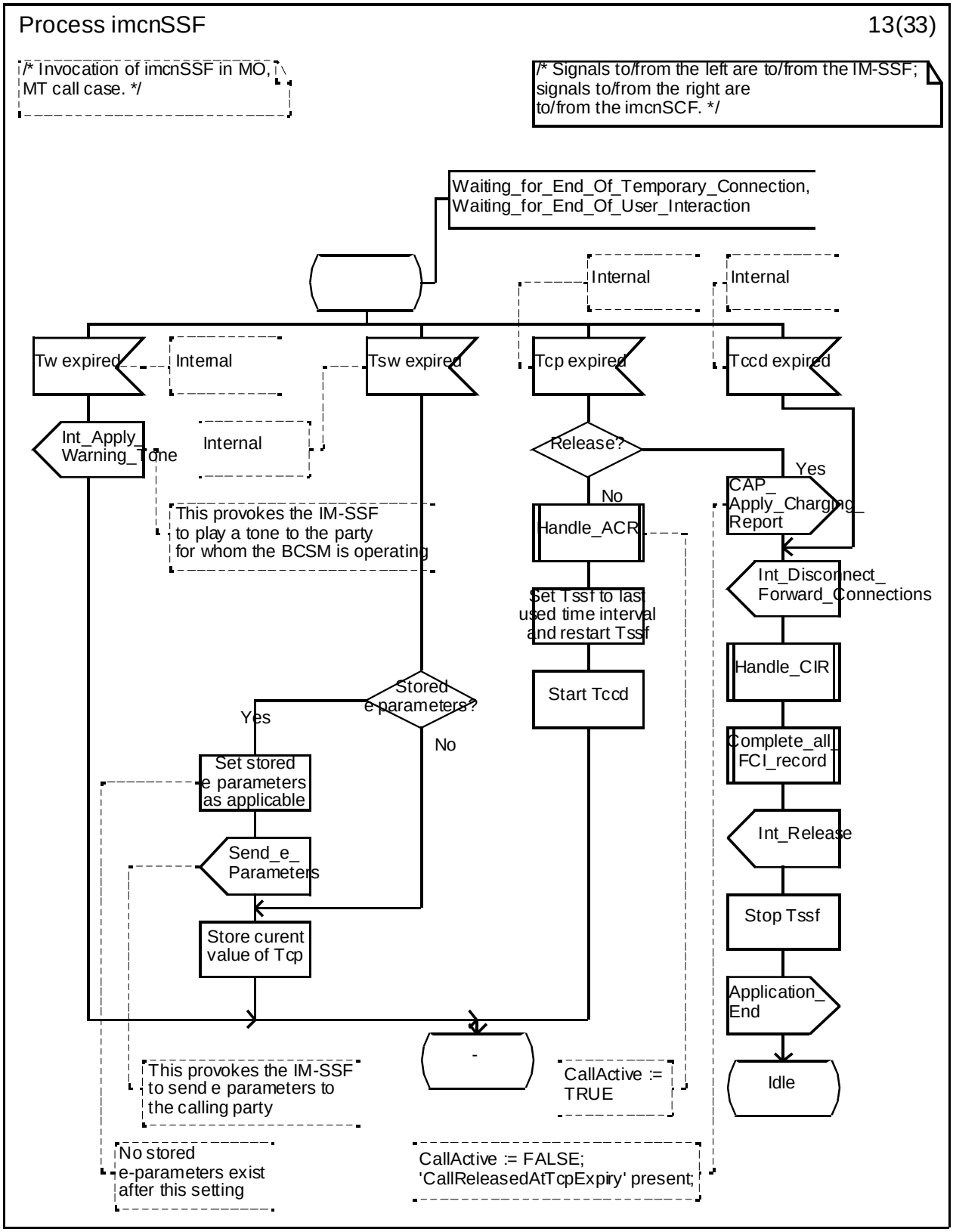

Figure 5.22m: Process imcnSSF (sheet 13)

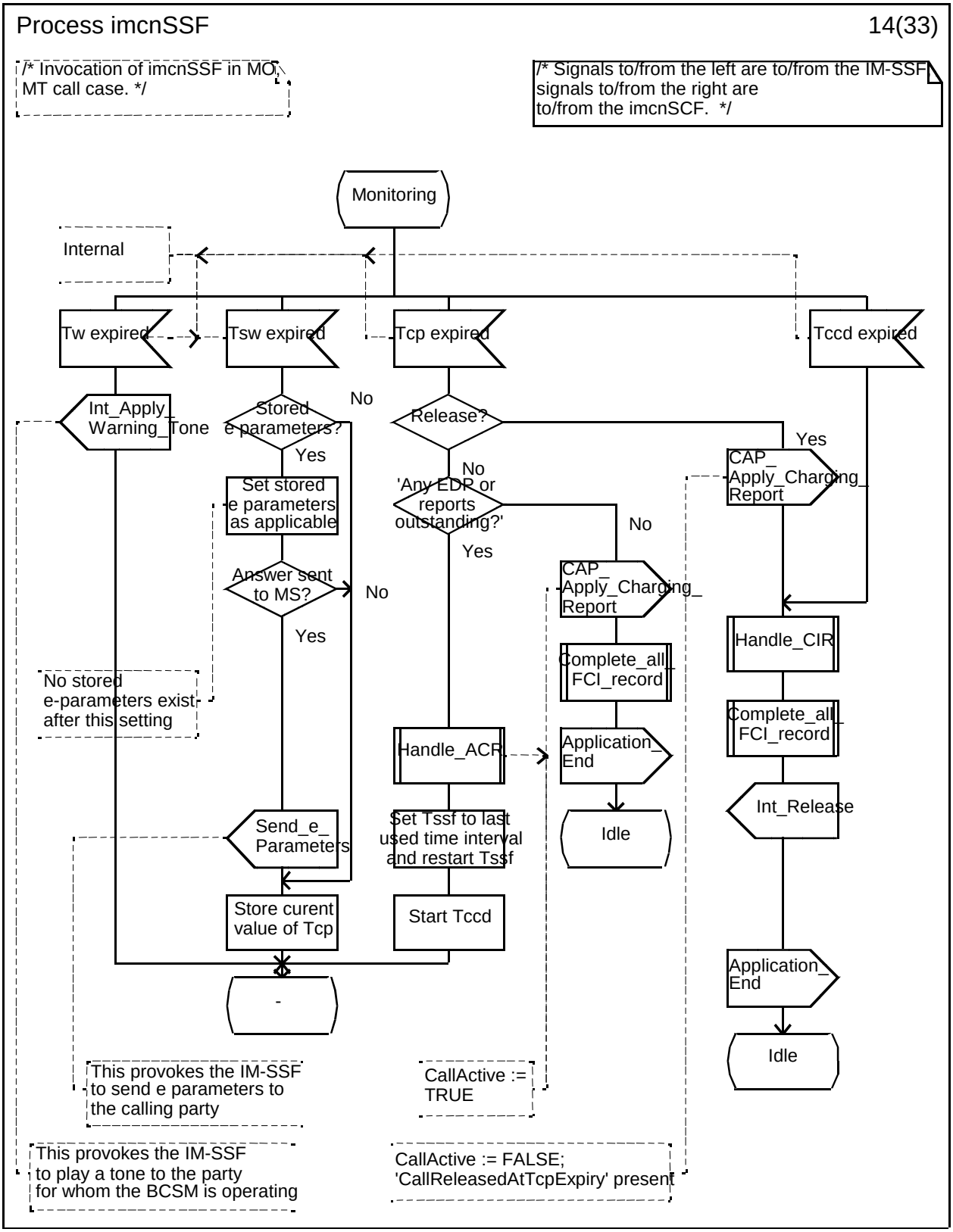

Figure 5.22n: Process imcnSSF (sheet 14)

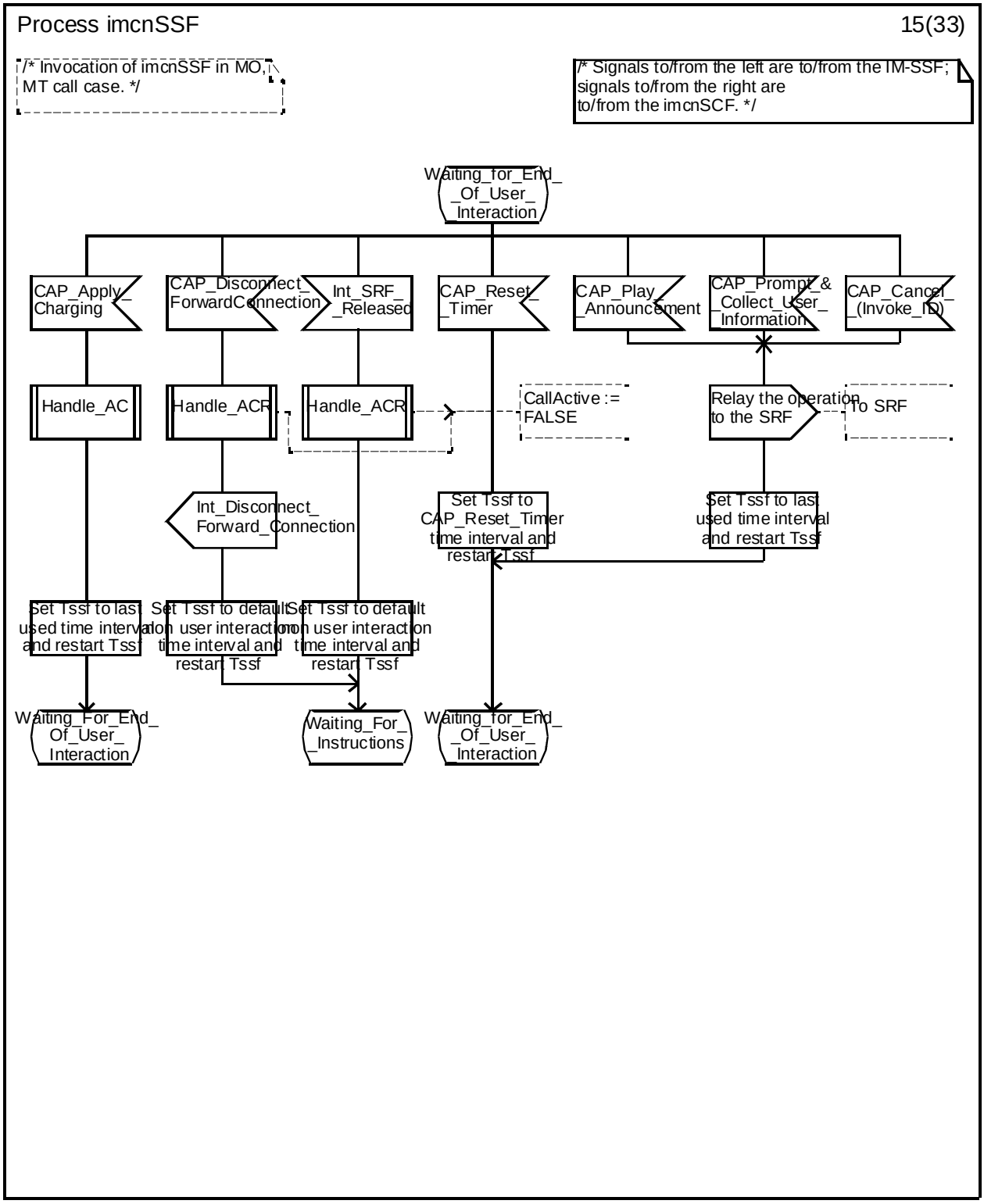

Figure 5.22o: Process imcnSSF (sheet 15)

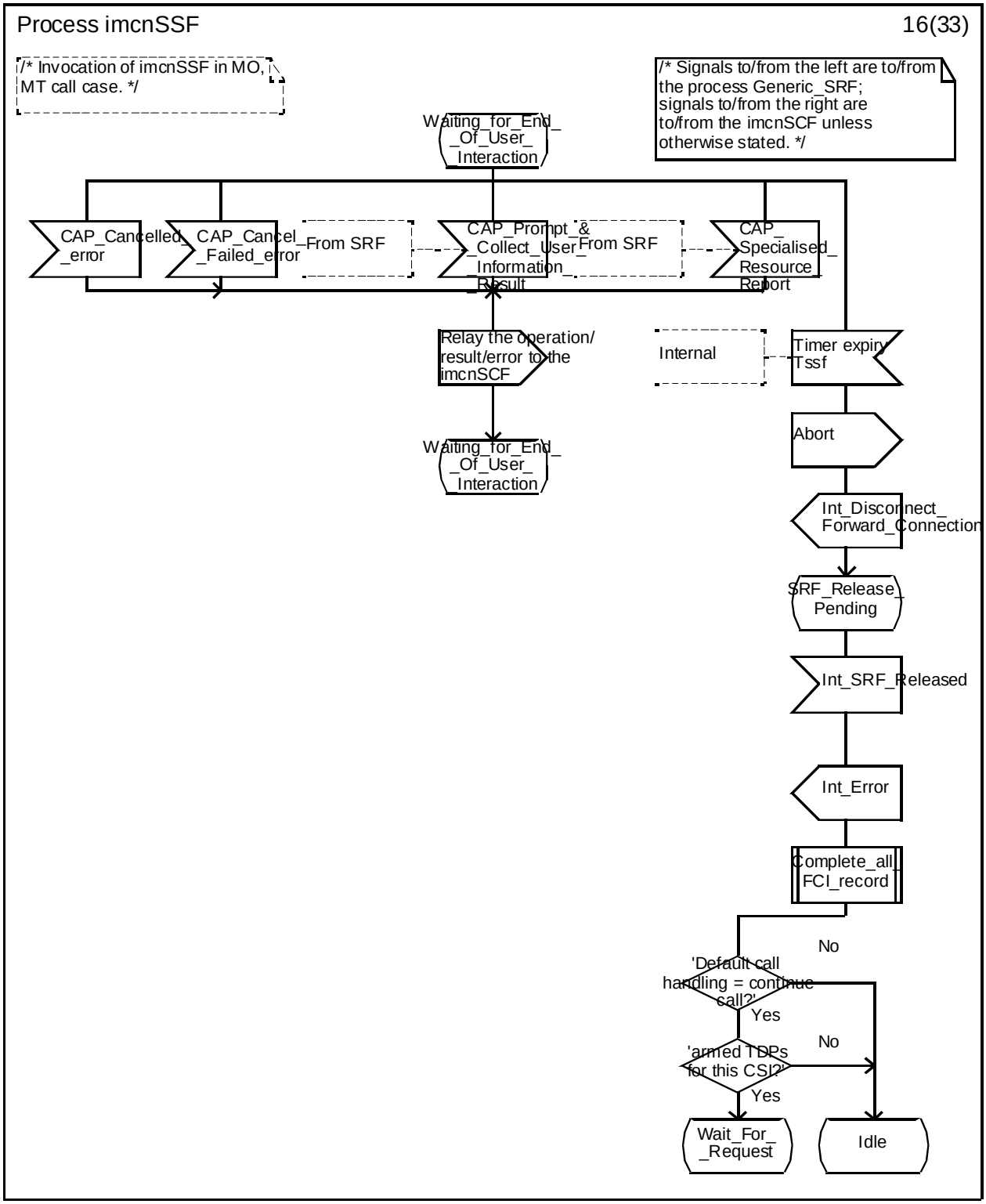

Figure 5.22p: Process imcnSSF (sheet 16)

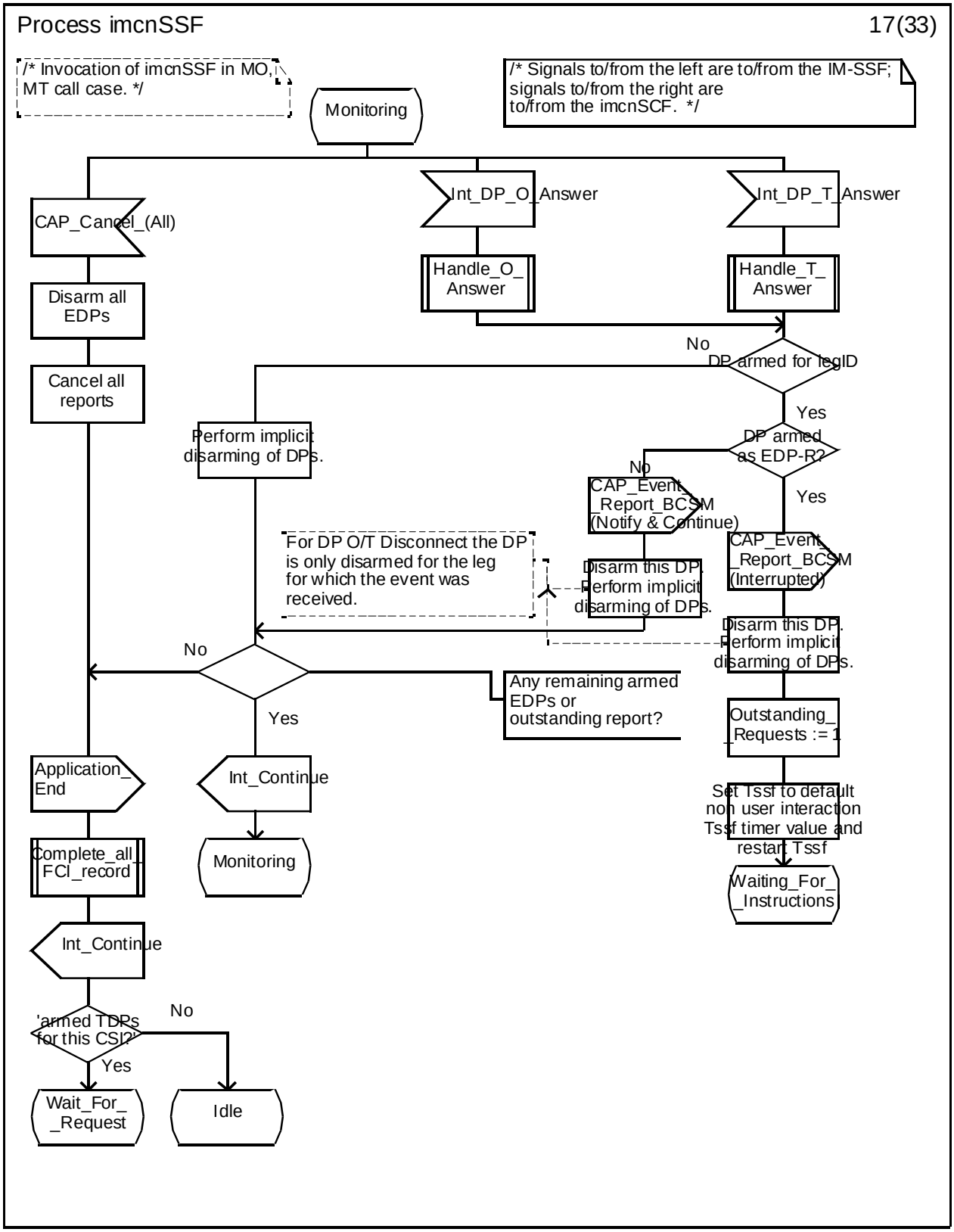

Figure 5.22q: Process imcnSSF (sheet 17)

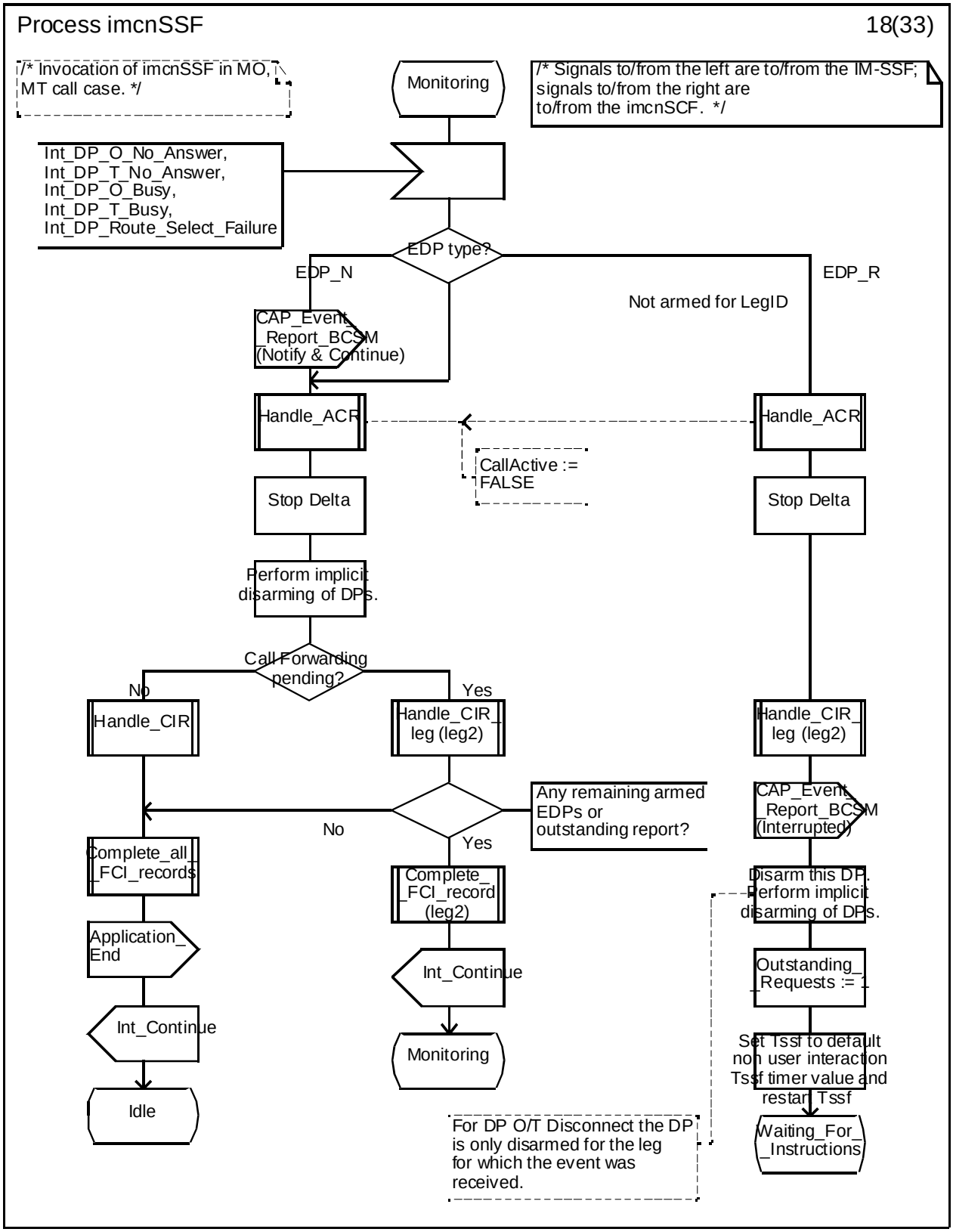

Figure 5.22r: Process imcnSSF (sheet 18)

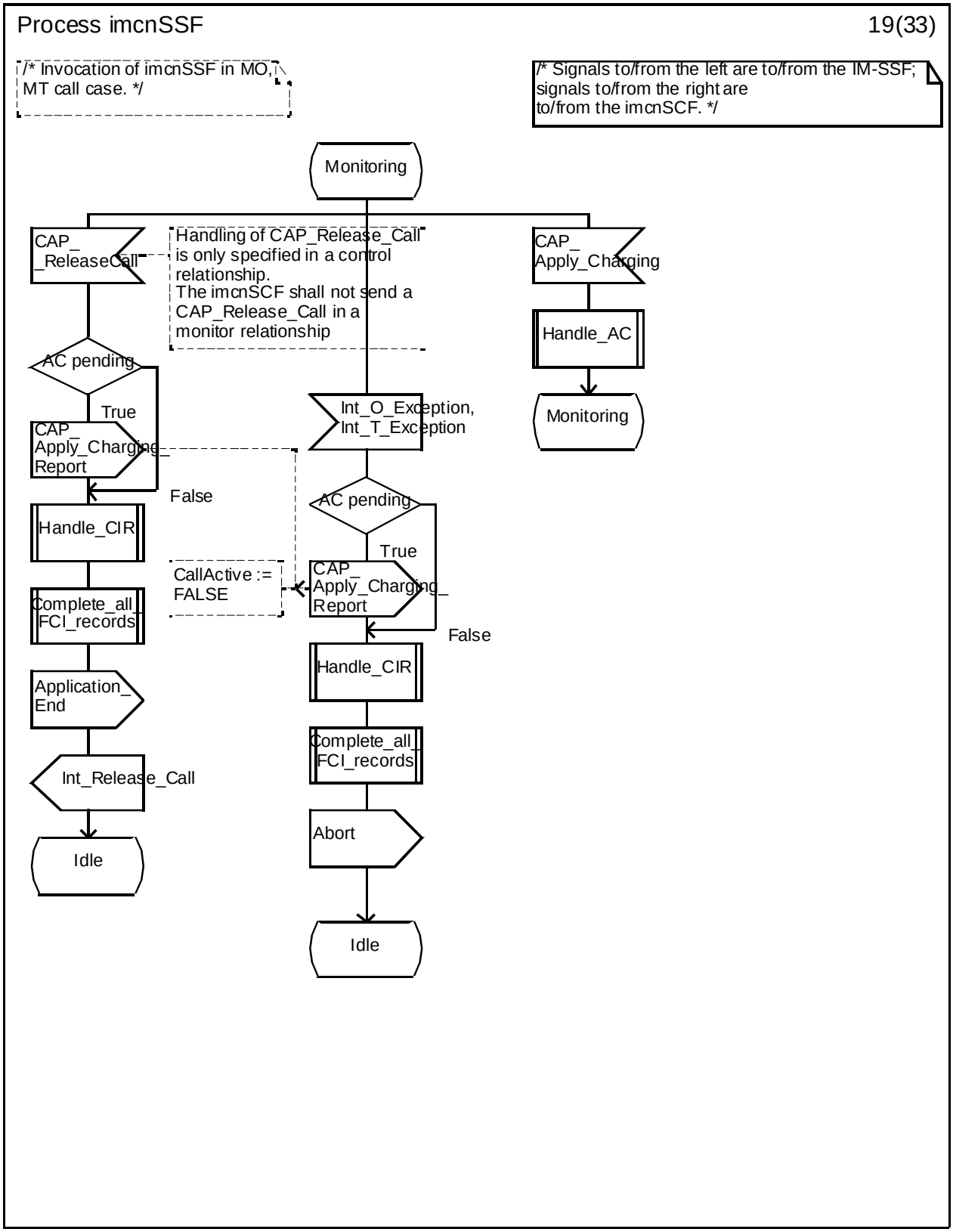

Figure 5.22s: Process imcnSSF (sheet 19)

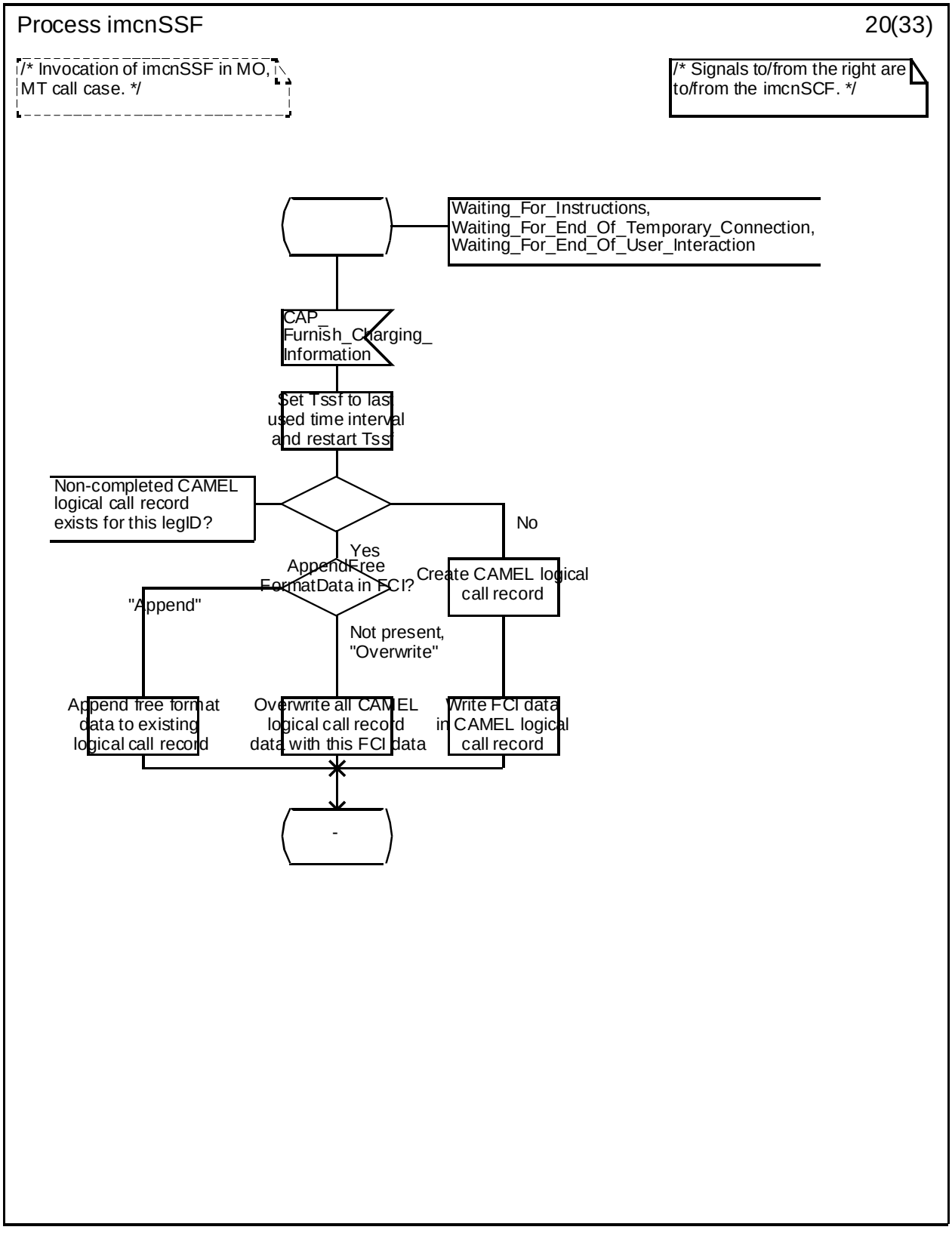

Figure 5.22t: Process imcnSSF (sheet 20)

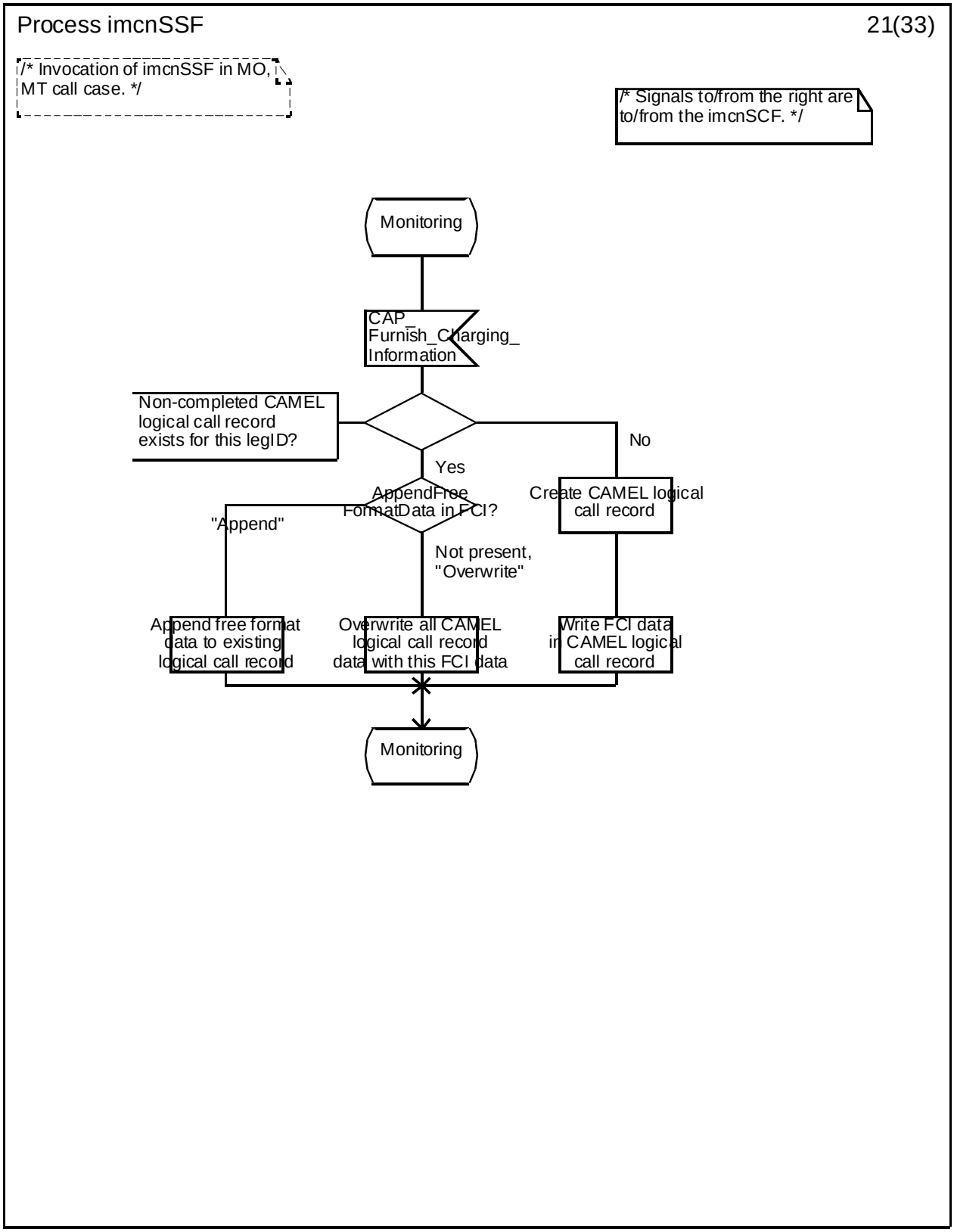

Figure 5.22u: Process imcnSSF (sheet 21)

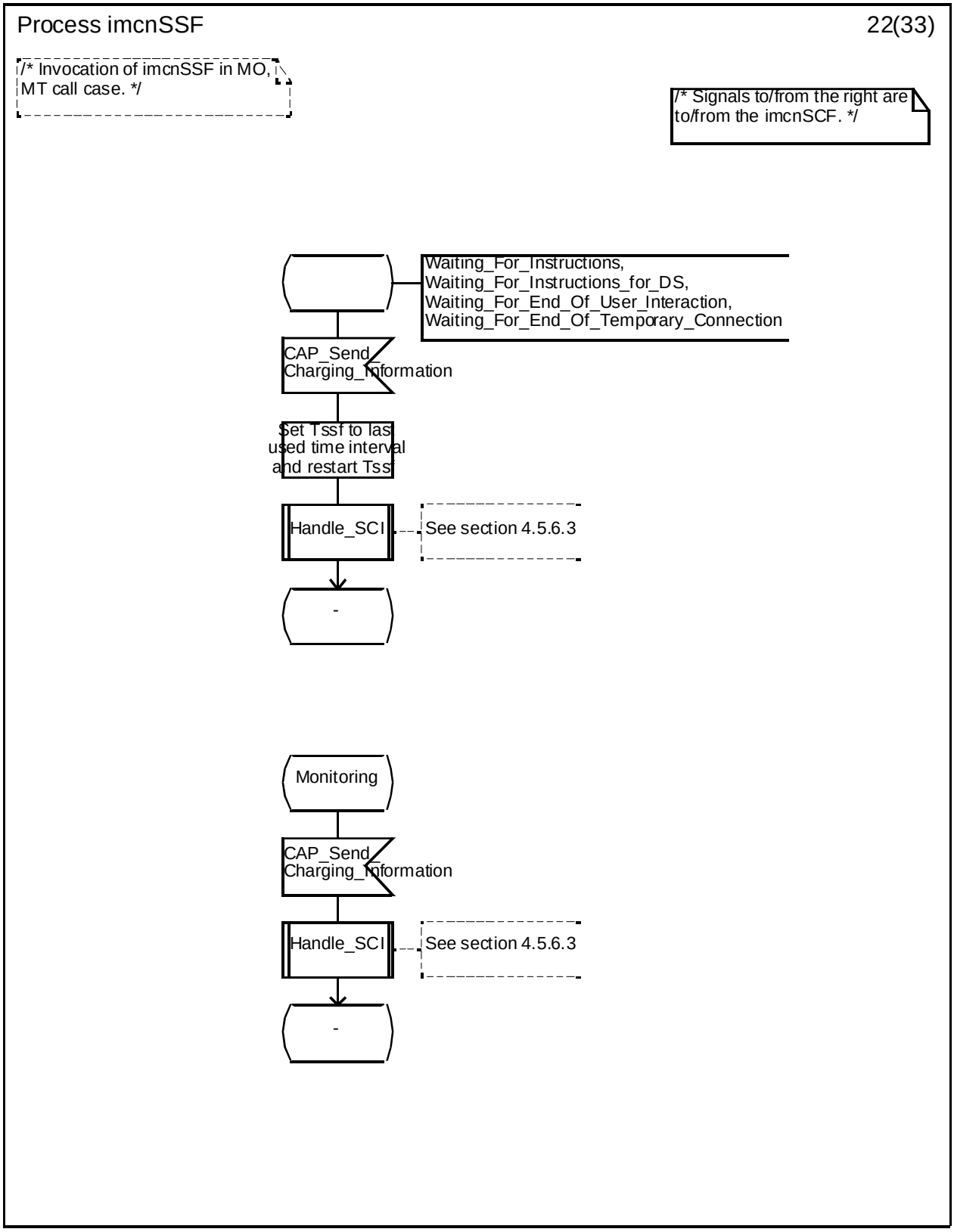

Figure 5.22v: Process imcnSSF (sheet 22)

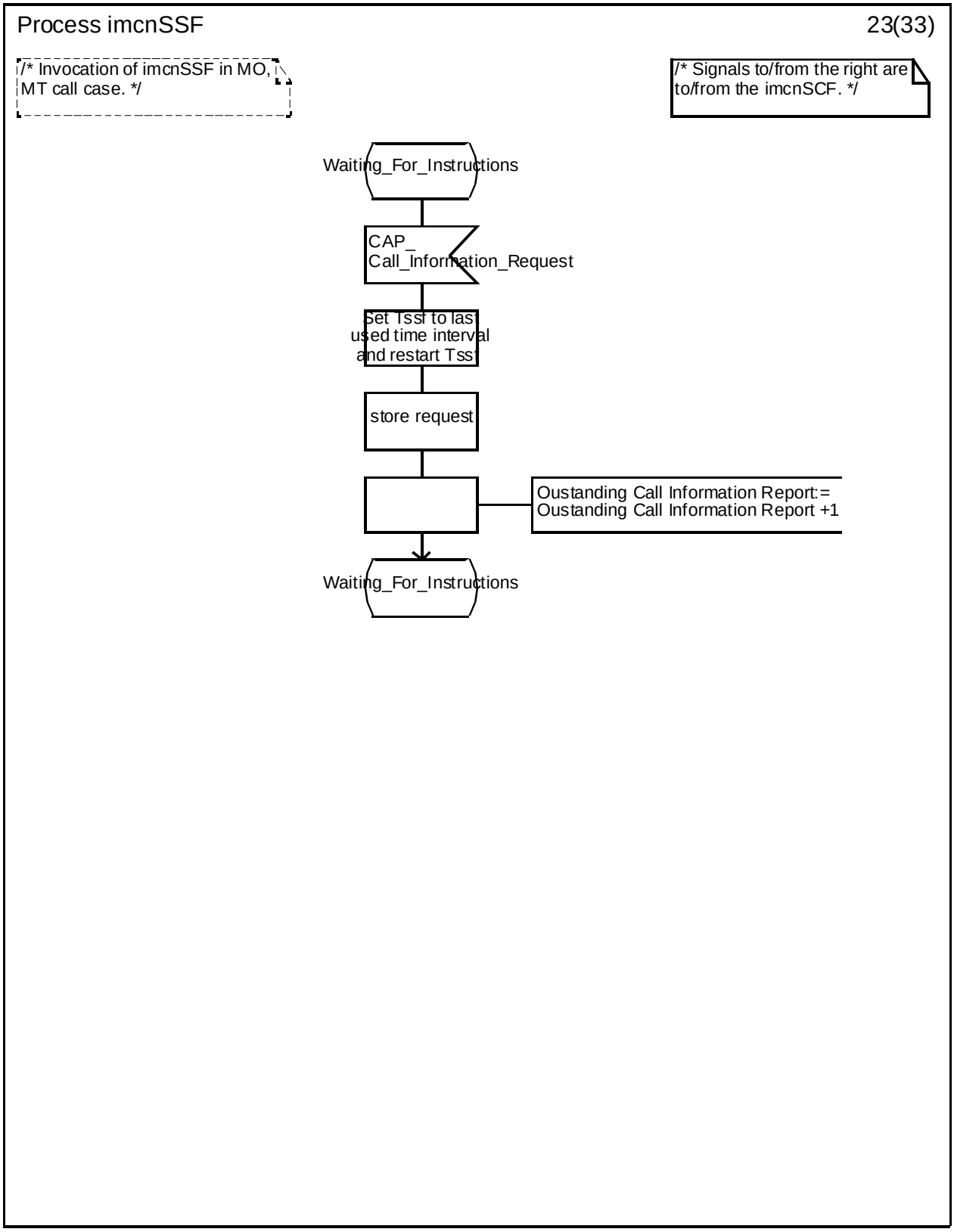

Figure 5.22w: Process imcnSSF (sheet 23)

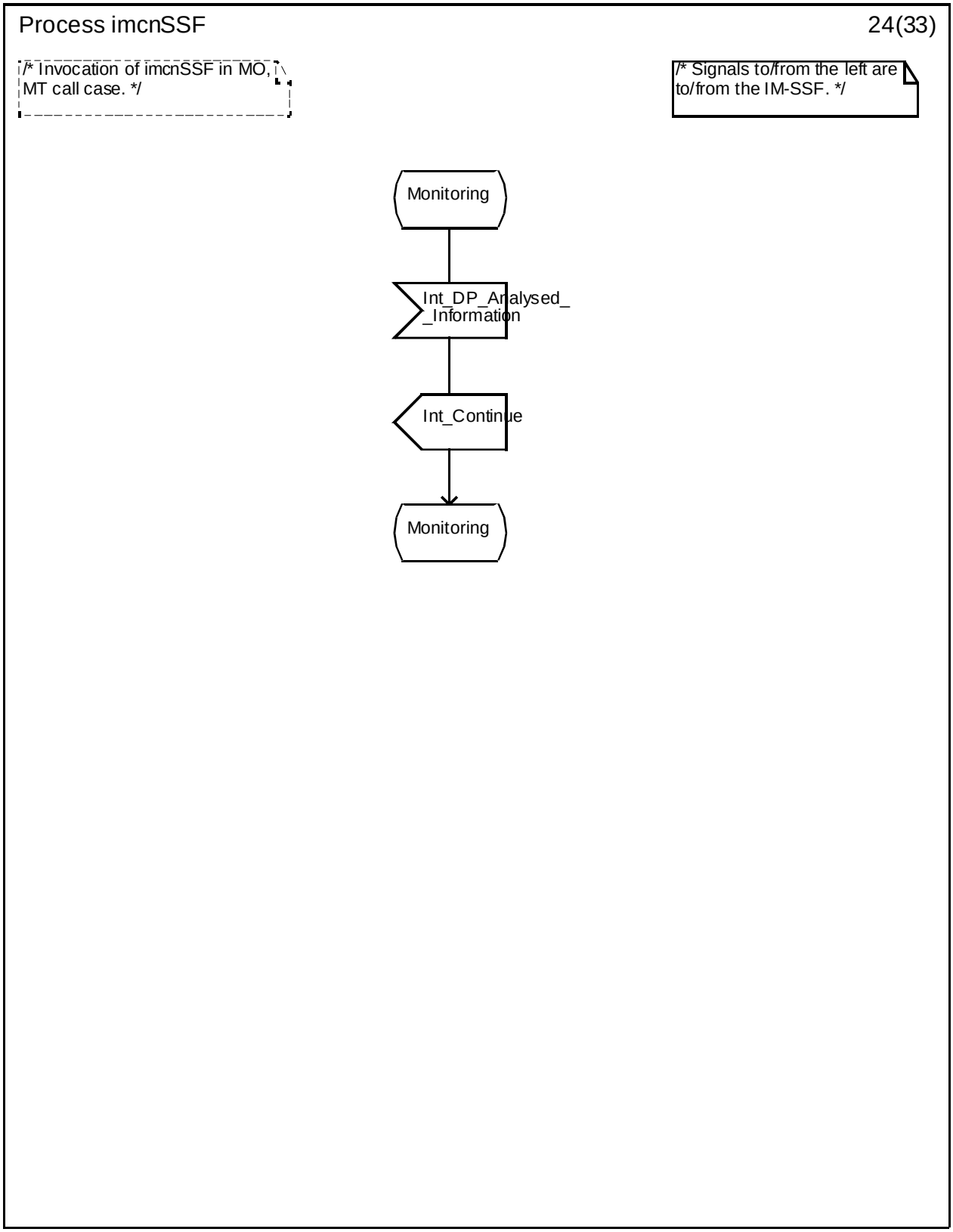

Figure 5.22x: Process imcnSSF (sheet 24)

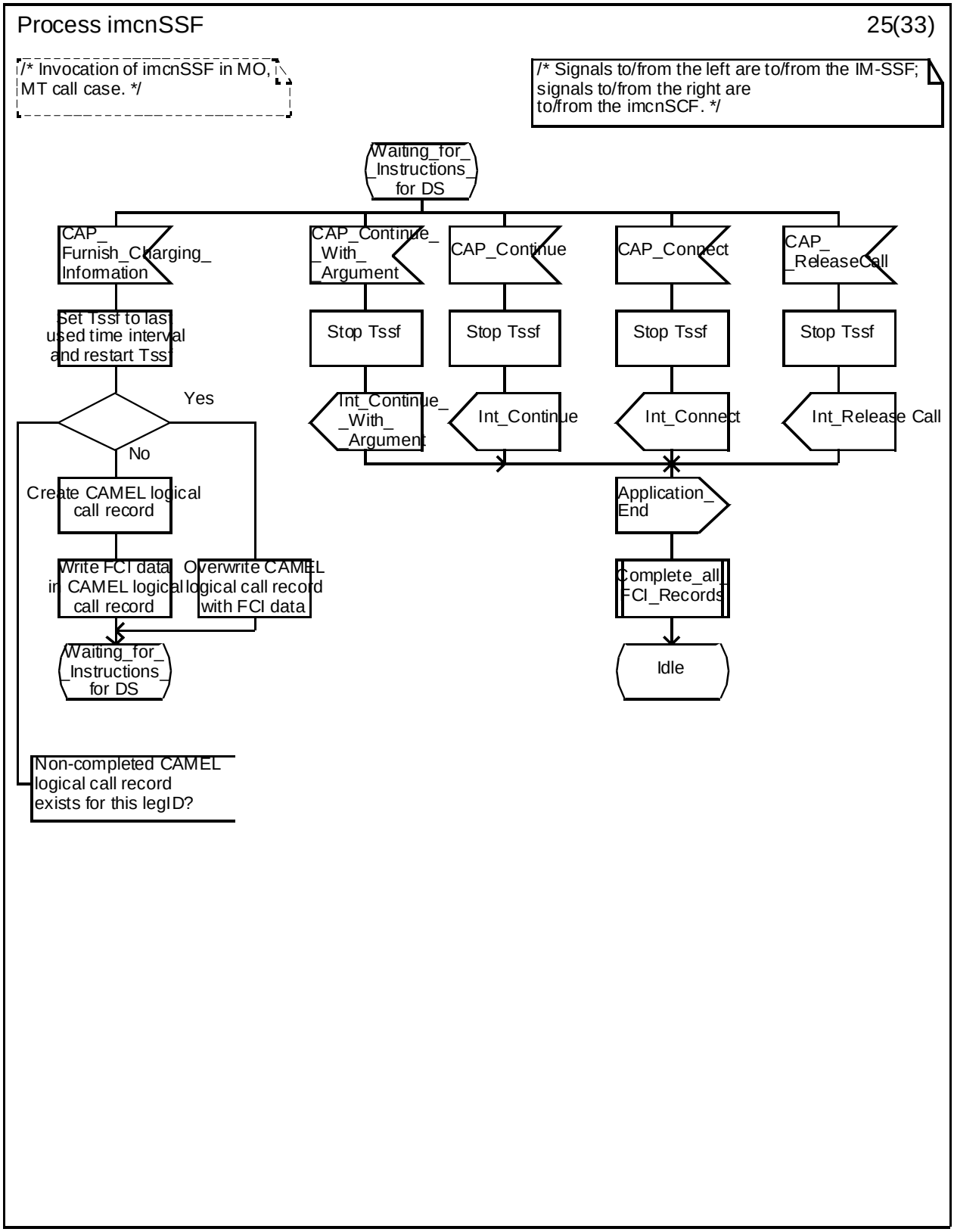

Figure 5.22y: Process imcnSSF (sheet 25)

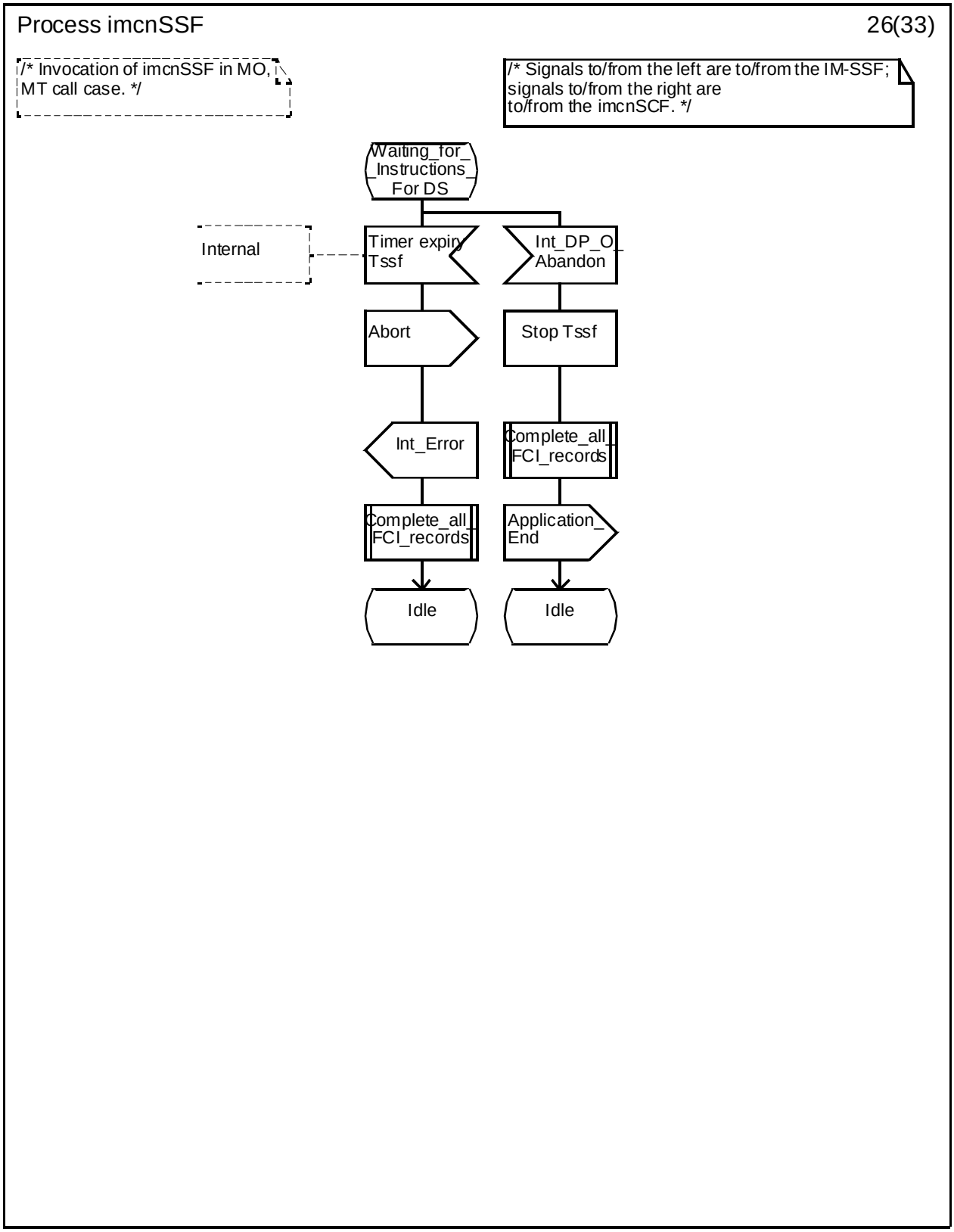

Figure 5.22z: Process imcnSSF (sheet 26)

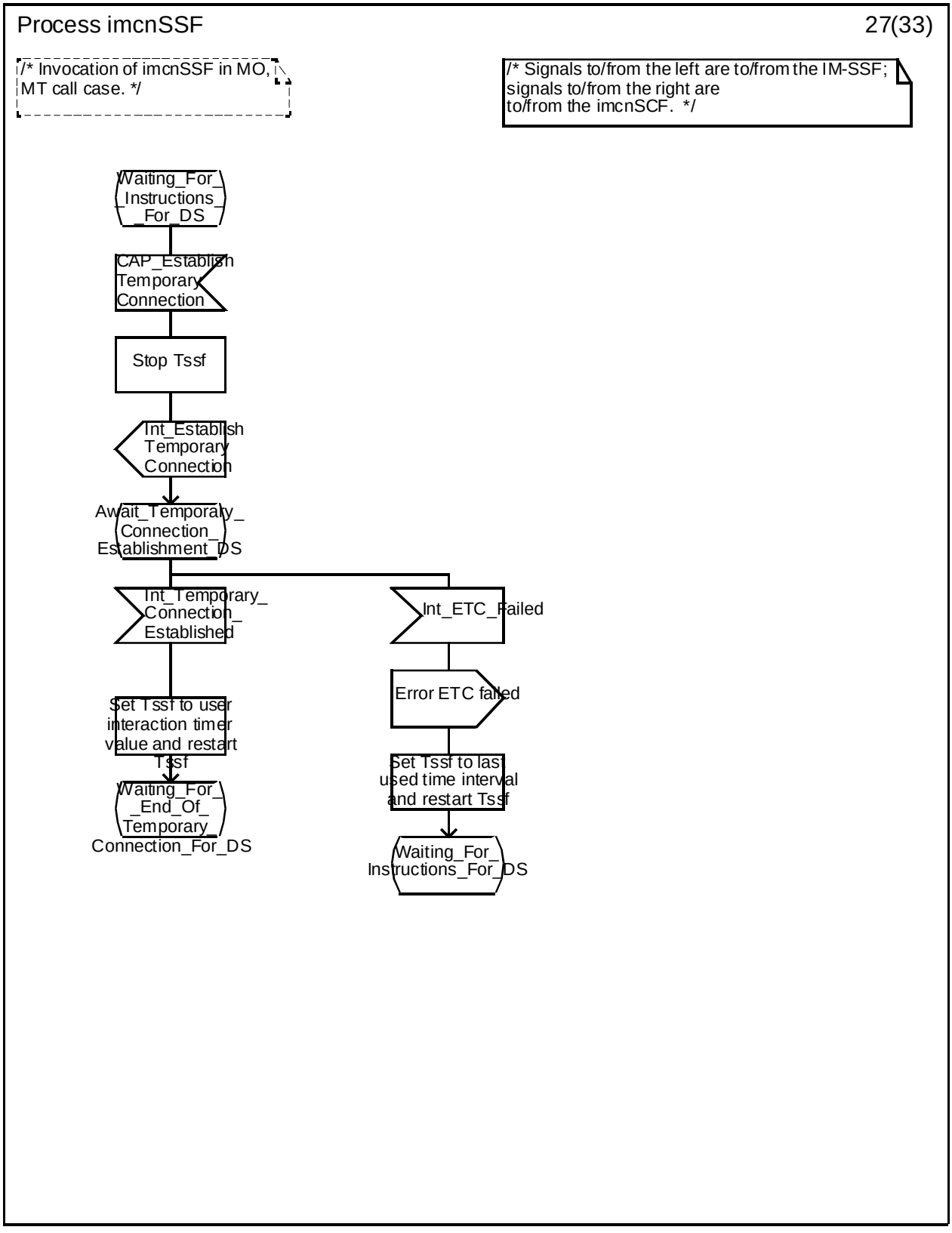

Figure 5.22aa: Process imcnSSF (sheet 27)

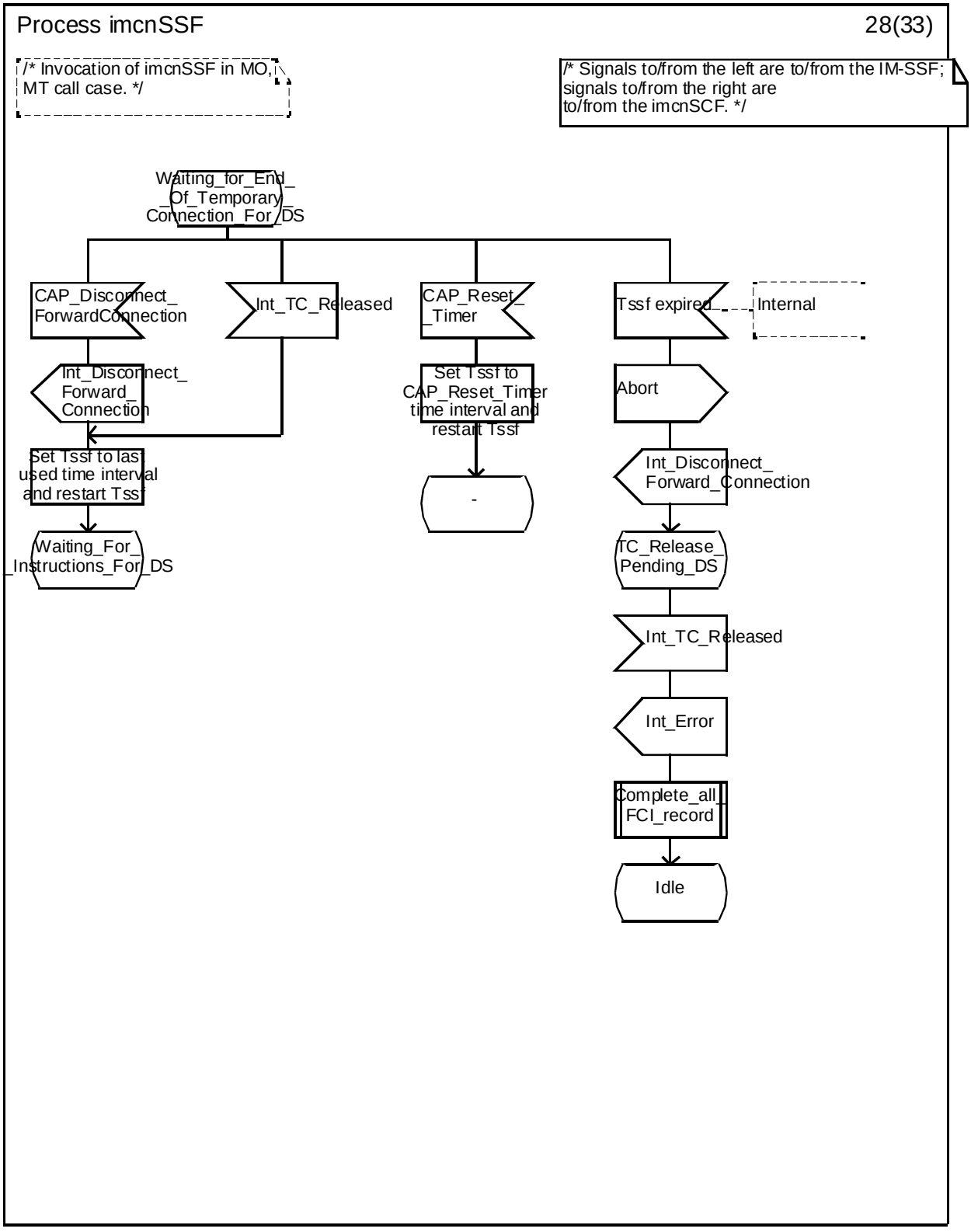

Figure 5.22bb: Process imcnSSF (sheet 28)

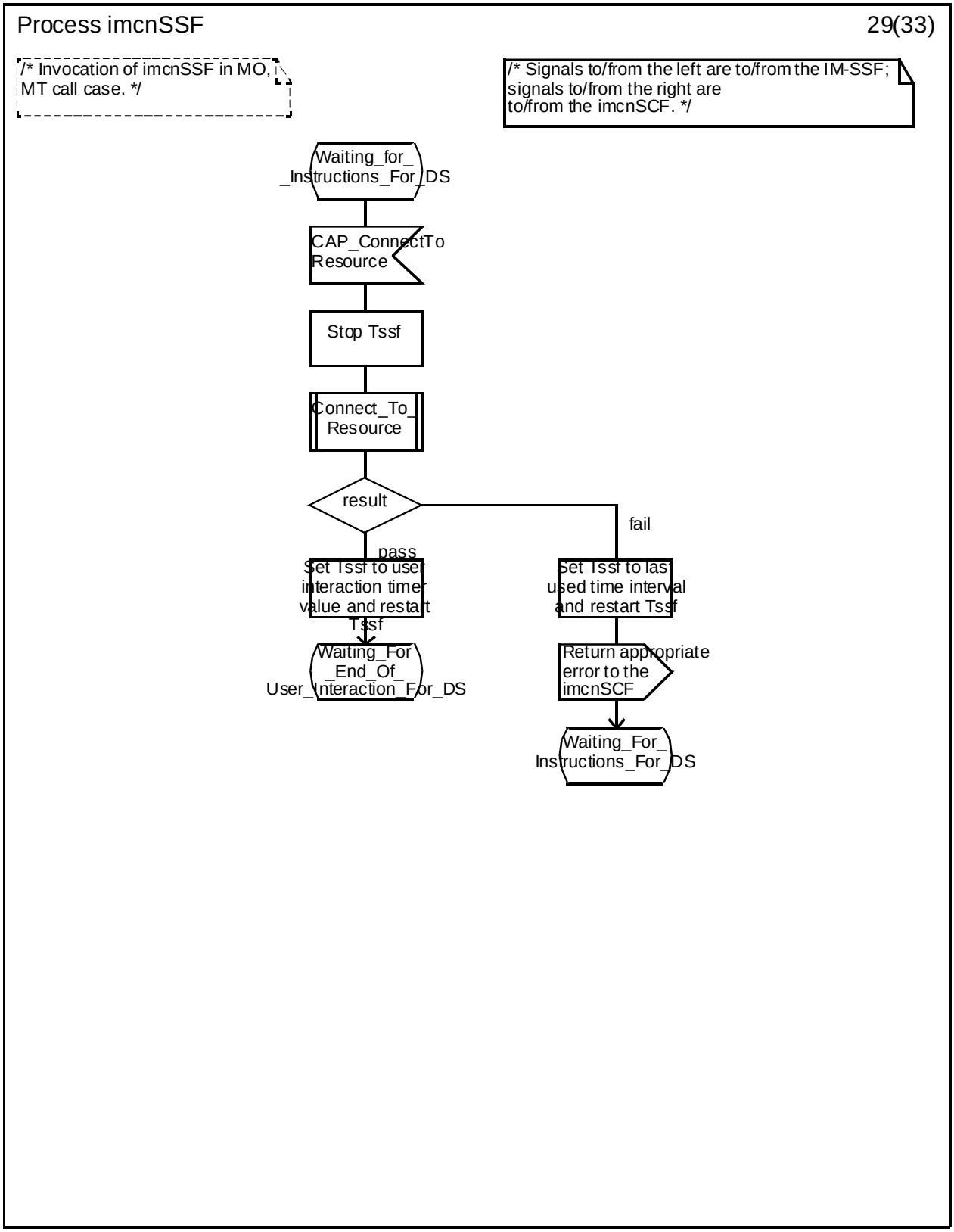

Figure 5.22cc: Process imcnSSF (sheet 29)

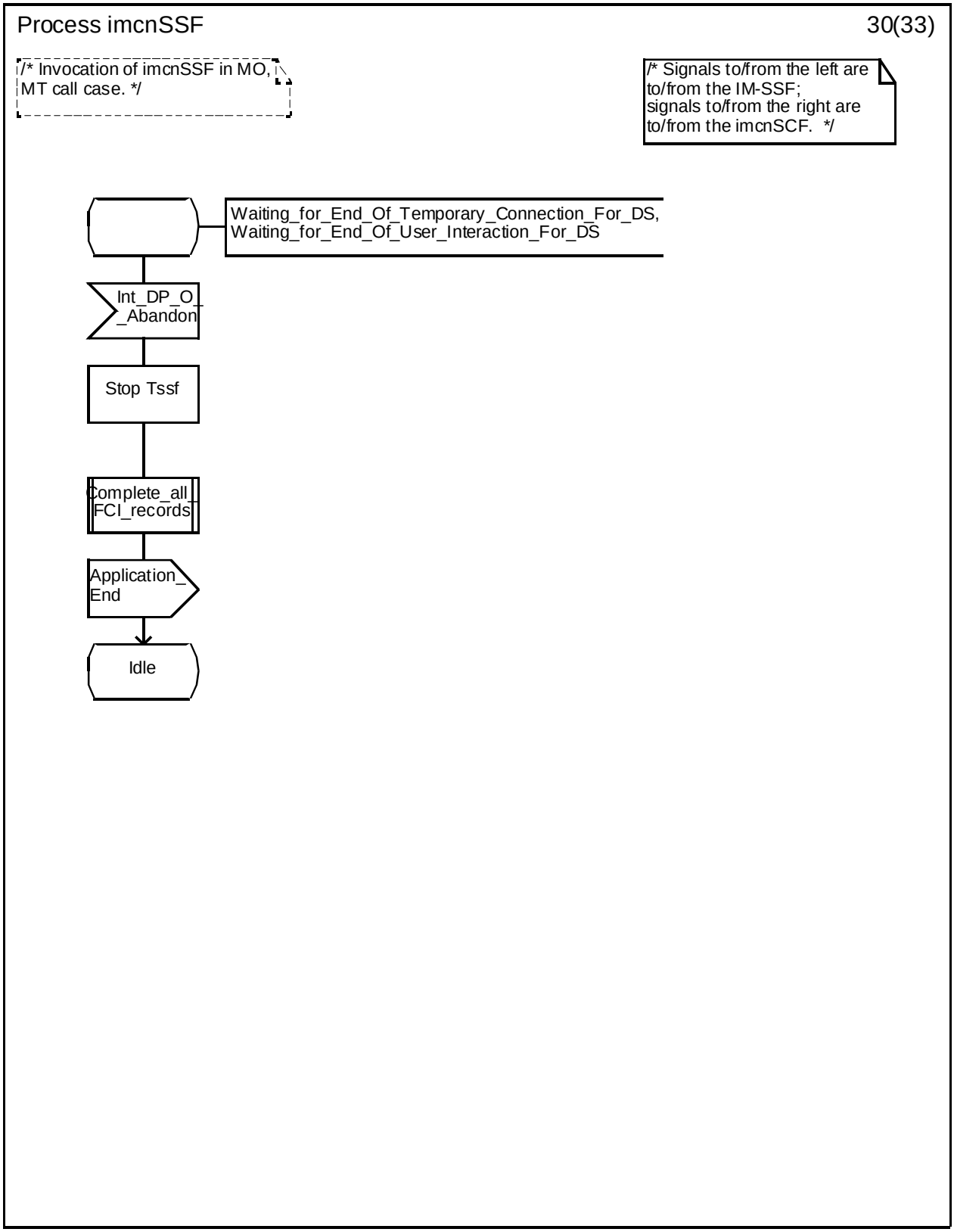

Figure 5.22dd: Process imcnSSF (sheet 30)

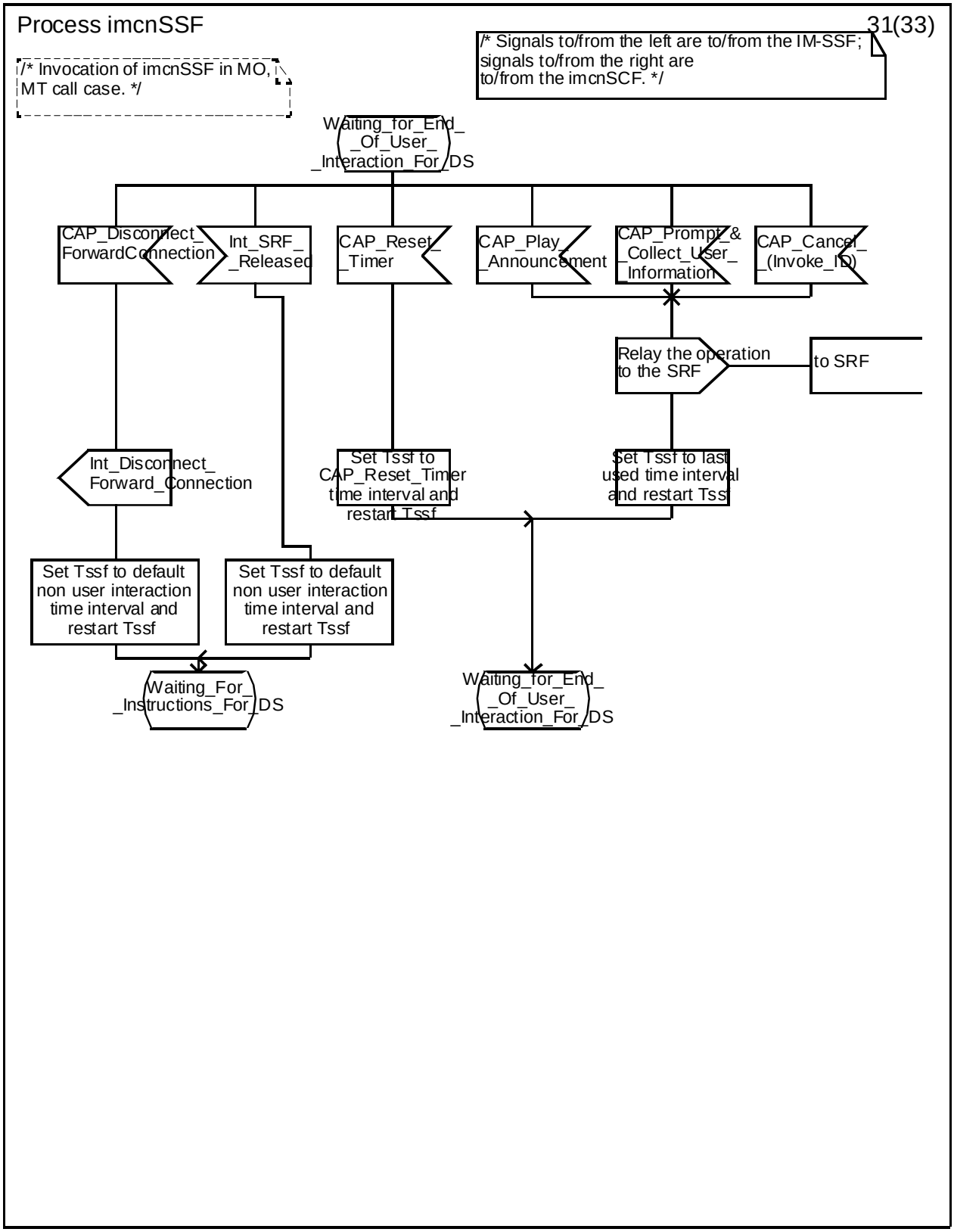

Figure 5.22ee: Process imcnSSF (sheet 31)

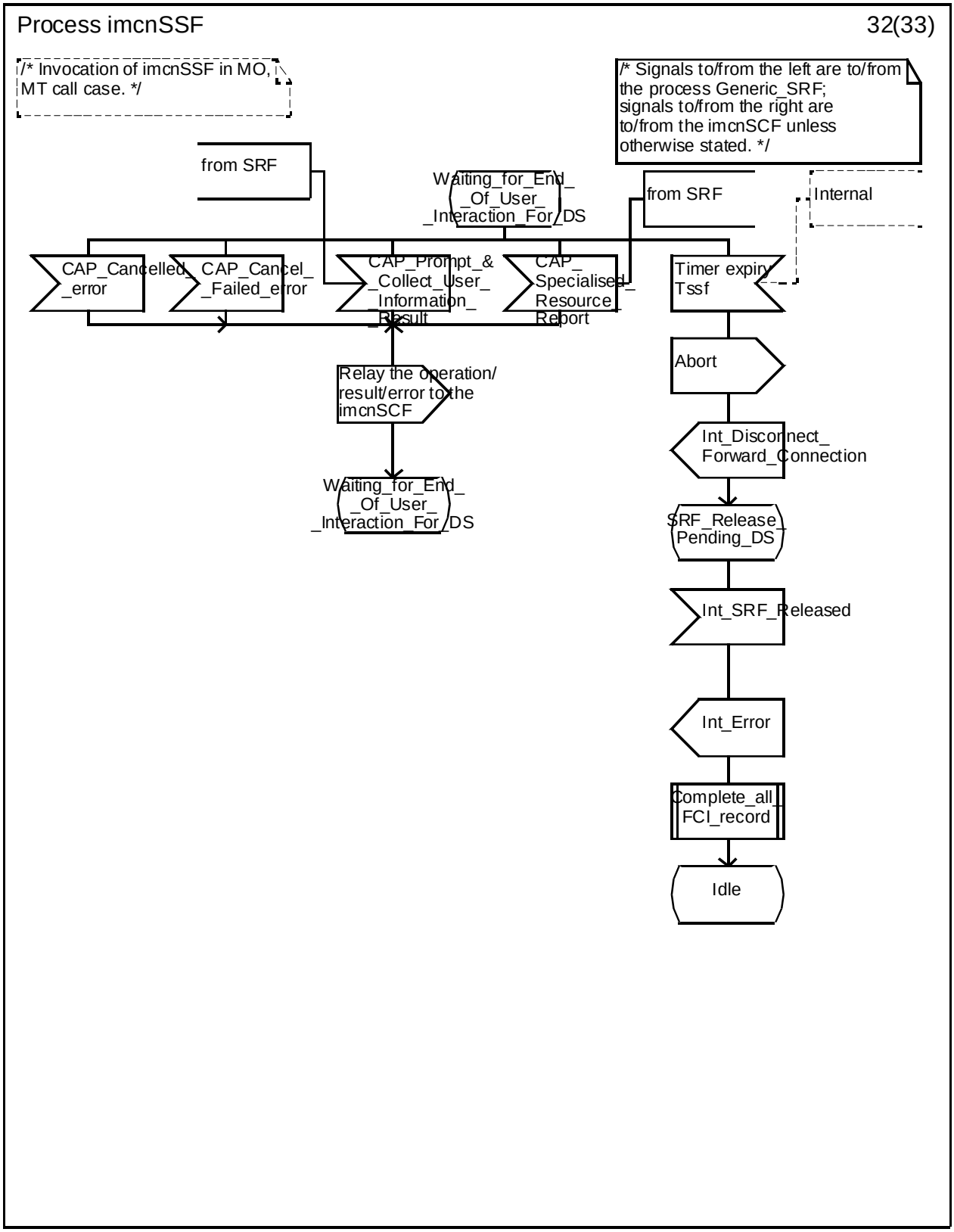

Figure 5.22 ff: Process imcnSSF (sheet 32)

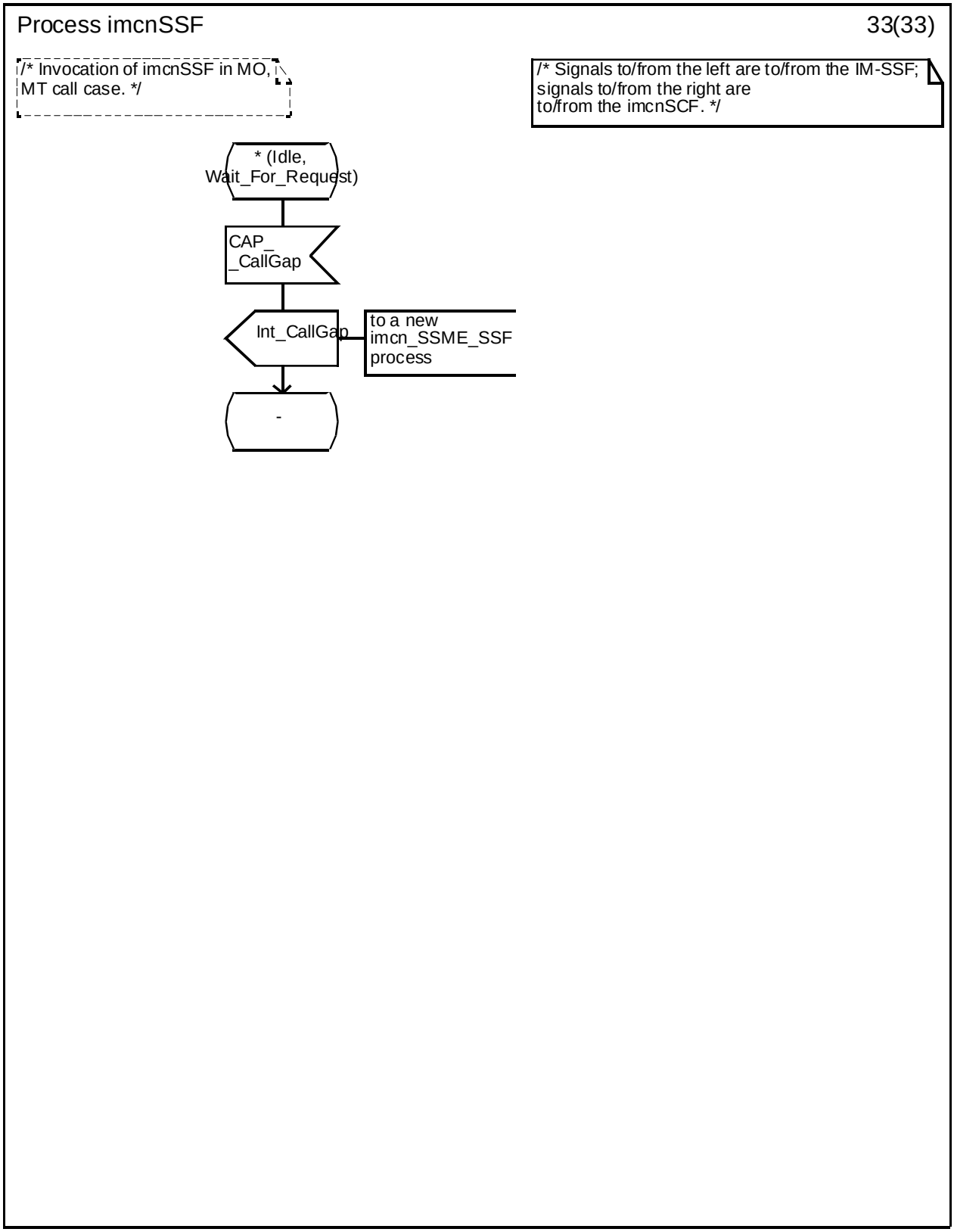

Figure 5.22gg: Process imcnSSF (sheet 33)

5.2 Descriptions of information Flows

5.2.1 imcnSSF to gsmSCF information flows

5.2.2 gsmSCF to imcnSSF information flows

5.2.3 Optional (service logic dependant) gsmSCF to gsmSRF information flows

5.2.4 IM-SSF to HSS information flows

5.2.4.1 Any Time Subscription Interrogation request

5.2.4.1.1 Description

This IF is used by the IM-SSF to request subscription information from the HSS/HLR. For example, the IM-SSF shall send this as a result of receiving a third party SIP registration from the S-CSCF (over the ISC interface). The IM-SSF shall also send the MAP ATSI request when a SIP INVITE message on a MT session for an unregistered subscriber is received.

5.2.4.1.2 Information ElementsInformation element name	Status	Description
gsmSCF Address	M	This IE shall indicate the address of the interrogating IM-SSF.
Requested Info	M	This IE indicates the type of subscriber information being requested. This shall consist of the CAMEL Subscription Information; the CAMEL Subscription Information is described in a table below.
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity shall be an IMSI.

CAMEL subscription information contains the following information elements:

Information element name	Status	Description
Additional Requested CAMEL Subscription Info	M	This IE shall contain one of the following: O-IM-CSI/VT-IM-CSI/D-IM-CSI

5.2.4.2 Notify Subscriber Data Change ack

5.2.4.2.1 Description

This IF is used to respond to the HSS/HLR's notification of the change of subscriber data.

5.2.4.2.2 Information Elements

This IF contains no information elements.

5.2.5 HSS to IM-SSF information flows

5.2.5.1 Any Time Subscription Interrogation ack

5.2.5.1.1 Description

This IF is used by the HSS/HLR to provide the requested subscriber's IM-CSI data to the IM-SSF.

5.2.5.1.2 Information Elements

Information element name	Status	Description
CAMEL Subscription Information	C	This IE shall be present if the subscriber is provisioned with a CAMEL Subscription Information for IM CN. This IE is described in a table below.

CAMEL Subscription Information contains the following information elements:

Information element name	Status	Description
O-IM-CSI	C	See subclause 4.4.1.1
D-IM-CSI	C	See subclause 4.4.1.2
VT-IM-CSI	C	See subclause 4.4.1.3

5.2.5.2 Notify Subscriber Data Change

5.2.5.2.1 Description

This IF is used by the HSS/HLR to notify to the IM-SSF of the change of subscriber IM CSI data. This IF is sent at each time subscriber IM CSI data is changed.

5.2.5.2.2 Information Elements

Information element name	Status	Description
IMSI	M	The IMSI is used to identify the subscriber.
MSISDN	C	This shall consist of the subscriber's MSISDN if available. If no MSISDN is available, the parameter shall be set with a dummy MSISDN value.
CAMEL Subscription Information	M	The CAMEL Subscription Information IE is used to indicate the modified or deleted CAMEL Subscription Information data. This IE is described in a table below.

CAMEL Subscription Information Modified contains the following information elements:

Information element name	Status	Description
O-IM-CSI	S	See subclause 4.4.1.1. It shall be present if it was modified.
D-IM-CSI	S	See subclause 4.4.1.2. It shall be present if it was modified.
VT-IM-CSI	S	See subclause 4.4.1.3. It shall be present if it was modified.
Specific CSI Deleted List	S	This IE indicates that one or more specific elements of IMS CAMEL Subscription Information have been deleted from the HSS/HLR. It shall indicate any of the following; - O-IM-CSI (with TDP criteria for O-IM-CSI); - D-IM-CSI; - VT-IM-CSI with TDP criteria for VT-IM-CSI; This IE shall be present if IM CSI is/are deleted.

6 Control and interrogation of subscription data

Support of the procedures described in this clause in CAMEL Phase 4 is a network operator option.

6.1 Architecture

The architecture for the control and the interrogation of subscription data described in the clause 10 in 3GPP TS 23.078 for the HLR and the gsmSCF applies for the HSS and the gsmSCF.

6.2 Procedures for CAMEL

6.2.1 Any Time Subscription Interrogation

The following process in the HLR described in 3GPP TS 23.078 applies for the handling of Any Time Interrogation for Subscription Information Retrieval in the HSS:

- CAMEL_ATSI_HLR.

6.2.2 Any Time Modification

The following process in the HLR described in 3GPP TS 23.078 applies for the handling of Any Time Modification in the HSS:

- CAMEL_ATM_HLR.

6.2.3 Notify Subscriber Data Change

The description of the procedure in 3GPP TS 23.078 applies for the handling of Notify Subscriber Data Change in the HSS.

6.3 Description of information flows

This subclause contains the detailed description of the information flows used by CAMEL for control and interrogation of subscription data.

Each Information Element (IE) is marked as Mandatory (M), Conditional (C), Specific conditions (S), mutually Exclusive (E) or Optional (O).

An 'M' IE shall always be included. A 'C' IE shall be included if the sending entity has the necessary information to populate the IE. The conditions for the inclusion of an 'S' IE are shown in the 'Description' column of the definition table. An 'O' IE may be included or omitted as required by the service logic. This categorization is a functional classification, i.e. it defines the requirements for the stage 2 information. It is not a stage 3 classification to be used for the ASN.1 syntax of the protocol.

The following principles apply for the handling of the IEs by the receiving entity:

- The gsmSCF may silently discard any IE which it does not functionally support.
- The HSS shall return an error if it does not functionally support an IE which it receives.

Details of errors and exceptions to these rules are specified in 3GPP TS 29.002 [32].

6.3.1 gsmSCF to HSS information flows

6.3.1.1 Any Time Modification Request

6.3.1.1.1 Description

This IF is used to modify information in the HSS at any time. The IF from the gsmSCF to the HLR is specified in 3GPP TS 23.078. The IF is also applied to the interface between the gsmSCF to the HSS.

6.3.1.2 Any Time Subscription Interrogation Request

6.3.1.2.1 Description

This IF is used to request subscription information from the HSS at any time. The IF from the gsmSCF to the HLR is specified in 3GPP TS 23.078. The IF is also applied to the interface between the gsmSCF to the HSS.

6.3.1.2.2 Information Elements

Any Time Subscription Interrogation Request is specified in 3GPP TS 23.078. Additionally the following IMS specific information elements are required:

Information element name	Status	Description
Requested Info	M	This IE may indicate supported CAMEL phases in HSS.
Additional CAMEL Subscription Info	S,E	This IE may be one of the following elements: O-IM-CSI / VT-IM-CSI / D-IM-CSI.

6.3.1.3 Notify Subscriber Data Change response

6.3.1.3.1 Description

This IF is used by the gsmSCF to respond to the HSS of the change of subscriber data notify. The IF from the gsmSCF to the HLR is specified in 3GPP TS 23.078. The IF is also applied to the interface between the gsmSCF to the HSS.

6.3.2 HSS to gsmSCF information flows

6.3.2.1 Any Time Modification ack

6.3.2.1.1 Description

This IF is used by the HSS to provide the modified information to the gsmSCF. The IF from the HLR to the gsmSCF is specified in 3GPP TS 23.078. The IF is also applied to the interface between the gsmSCF to the HSS.

6.3.2.1.2 Information Elements

Any Time Modification ack is specified in 3GPP TS 23.078. Additionally the following IMS specific information elements are required:

Information element name	Status	Description
O-IM-CSI	S	See subclause 4.4.1.1. It shall be present if it was modified.
VT-IM-CSI	S	See subclause 4.4.1.3. It shall be present if it was modified.
D-IM-CSI	S	See subclause 4.4.1.2. It shall be present if it was modified.

6.3.2.2 Any Time Subscription Interrogation ack

6.3.2.2.1 Description

This IF is used by the HSS to provide the requested subscription information to the gsmSCF. The IF from the HLR to the gsmSCF is specified in 3GPP TS 23.078. The IF is also applied to the interface between the gsmSCF to the HSS.

6.3.2.2.2 Information Elements

Any Time Subscription Interrogation ack is specified in 3GPP TS 23.078. Additionally the following IMS specific information elements are required:

Information element name	Status	Description
Supported CAMEL Phases In HSS	C	This IE indicates the CAMEL phase supported in the HSS.
O-IM-CSI	C	See subclause 4.4.1.1.
VT-IM-CSI	C	See subclause 4.4.1.3.
D-IM-CSI	C	See subclause 4.4.1.2.

6.3.2.3 Notify Subscriber Data Change

6.3.2.3.1 Description

This IF is used by the HSS to notify to the gsmSCF of the change of subscriber data. This IF is sent at each time subscriber data is changed. The IF from the HLR to the gsmSCF is specified in 3GPP TS 23.078. The IF is also applied to the interface between the gsmSCF to the HSS.

6.3.2.3.2 Information Elements

Notify Subscriber Data Change is specified in 3GPP TS 23.078. Additionally the following IMS specific information elements are required:

Information element name	Status	Description
Specific CSI Deleted List	S	This IE shall indicate any of the following; - O-IM-CSI (with TDP criteria for O-IM-CSI); - D-IM-CSI (with TDP criteria for D-IM-CSI); - VT-IM-CSI with TDP criteria for VT-IM-CSI;

7 Subscriber Location and State retrieval

Support of the procedures described in this clause in CAMEL Phase 4 is a network operator option.

7.1 Architecture

The architecture for the subscriber location and state retrieval described in the clause 11 in 3GPP TS 23.078 for the HLR and the gsmSCF applies for the HSS and the gsmSCF.

7.2 Procedures for CAMEL

7.2.1 Any Time Interrogation

The description of the procedure in 3GPP TS 23.078 applies for the Any Time Interrogation in the HSS.

7.3 Description of information flows

This subclause contains the detailed description of the information flows used by CAMEL for the retrieval of information about the location and state of a subscriber.

Each Information Element (IE) is marked as Mandatory (M), Conditional (C), Specific conditions (S), mutually Exclusive (E) or not applicable (-).

An 'M' IE shall always be included. A 'C' IE shall be included if the sending entity has the necessary information to populate the IE. The conditions for the inclusion of an 'S' IE are shown in the 'Description' column of the definition table. When a set of 'E' IEs is shown in the definition of an Information Flow or compound IE, only one of those IEs may be included. A '-' IE shall always be omitted. This categorization is a functional classification, i.e. it defines the requirements for the stage 2 information. It is not a stage 3 classification to be used for the ASN.1 syntax of the protocol.

The following principles apply for the handling of the IEs by the receiving entity:

- The gsmSCF may silently discard any IE which it does not functionally support.
- The GMLC shall return an error if it does not functionally support an IE which it receives.

Details of errors and exceptions to these rules are specified in 3GPP TS 29.002 [32].

7.3.1 gsmSCF to HSS information flows

7.3.1.1 Any Time Interrogation Request

7.3.1.1.1 Description

This IF is used to request information (any one or more of subscriber state, subscriber location, IMEI & software version, MS classmark information for the CS domain and GPRS MS classmark information) from the HSS at any time. The IF from the gsmSCF to the HLR is specified in 3GPP TS 23.078. The IF is also applied to the interface between the gsmSCF to the HSS.

7.3.2 HSS to gsmSCF information flows

7.3.2.1 Any Time Interrogation ack

7.3.2.1.1 Description

This IF is used by the HSS to provide the requested subscriber location and/or subscriber state information to the gsmSCF. The IF from the HLR to the gsmSCF is specified in 3GPP TS 23.078. The IF is also applied to the interface between the gsmSCF to the HSS.