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Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 2;
Stage 2
(3GPP TS 03.78 version 6.8.0 Release 1997)**

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Contents

Foreword

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

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1 Scope

The present document specifies the stage 2 description for the second phase (see 3GPP TS 02.78 [2]) of the Customized Applications for Mobile network Enhanced Logic (CAMEL) feature which provides the mechanisms to support services of operators which are not covered by standardized GSM services even when roaming outside the HPLMN.

The CAMEL feature is a network feature and not a supplementary service. It is a tool to help the network operator to provide the subscribers with the operator specific services even when roaming outside the HPLMN.

In this specification, the GSM Service Control Function (gsmSCF) is treated as being part of the HPLMN. The regulatory environment in some countries may require the possibility that the gsmSCF and the HPLMN are controlled by different operators, and the gsmSCF and the HPLMN are therefore distinct entities.

In the second phase the CAMEL feature supports:

- mobile originated and forwarded calls;
- mobile terminating calls;
- any time interrogation;
- suppression of announcements;
- announcements, in band user interaction;
- charging features;
- supplementary service invocation notifications;
- USSD interaction with the gsmSCF.
- North American carrier selection.

Note that CAMEL is not applicable to Emergency Setup (TS 12), i.e., in case an Emergency call has been requested the gsmSSF shall not be invoked.

The mechanism described in the present document addresses especially the need for information exchange between the VPLMN or IPLMN and the HPLMN for support of operator specific services. Any user procedures for the control of operator specific services are outside the scope of the present document. Subscribers who have subscribed to operator specific services and therefore need the functional support of the CAMEL feature shall be marked in the HPLMN and VPLMN. In case a subscriber is marked to need CAMEL support, the appropriate procedures which provide the necessary information to the VPLMN or the HPLMN are invoked. It is possible for the HPLMN to instruct the VPLMN or IPLMN to interact with a gsmSCF which is controlled by the HPLMN.

The specification of operator specific services is outside the scope of the present document.

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.

[1] 3GPP TS 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] 3GPP TS 02.78: "Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL) - Phase 2. Service description. Stage 1

[3] 3GPP TS 03.18: "Digital cellular telecommunications system (Phase 2+); Basic call handling ; Technical realisation".

[4] 3GPP TS 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[5] 3GPP TS 09.78: "Digital cellular telecommunications system (Phase 2+); CAMEL Application Part (CAP) specification - Phase 2".

[6] ITU-T Q.1214, May 1995: "Distributed Functional Plane for Intelligent Network CS-1"

[7] EN 301 070-1 v1.1.1. "Integrated Services Digital Network (ISDN) ; Signalling System No.7 ; ISDN User Part (ISUP) version 3 interactions with the Intelligent Network Application Part (INAP) ; Part 1 : Protocol specification [ITU-T Recommendation Q.1600 (1997), modified]".

[8] 3GPP TS 03.90 : "Digital cellular telecommunication system (Phase 2+); Unstructured Supplementary Service Data (USSD) - Stage 2".

[9] (void)

[10] (void)

[11] 3GPP TS 03.84: "Digital cellular telecommunications system; Multi Party (MPTY) supplementary services - Stage 2".

[12] 3GPP TS 03.91: "Digital cellular telecommunications system; Explicit Call Transfer (ECT) supplementary service – Stage 2".

[13] 3GPP TS 03.82: "Call Forwarding (CF) Supplementary Services; Stage 2".

[14] 3GPP TS 02.24: "Description of Charge Advice Information (CAI)".

[15] 3GPP TS 03.79: "Support of Optimal Routing phase 1; Stage 2".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Basic Call State Model (BCSM): The BCSM provides a high-level model of GMSC- or MSC/VLR-activities required to establish and maintain communication paths for users. As such, it identifies a set of basic call activities in a GMSC or MSC/VLR and shows how these activities are joined together to process a basic call.

Call Control Function (CCF): The CCF is the Call Control Function in the network that that provides call/service processing and control (see ITU-T Q.1214 [6]).

Detection Points (DP): The points in processing at which notifications (to the service logic) can occur and transfer of control (to the gsmSCF) is possible are called Detection Points (DPs).

GSM Service Control Function (gsmSCF): A functional entity that contains the CAMEL service logic to implement OSS. It interfaces with the gsmSSF, the gsmSRF and the HLR.

GSM Service Switching Function (gsmSSF): A functional entity that interfaces the MSC/GMSC to the gsmSCF. The concept of the gsmSSF is derived from the IN SSF, but uses different triggering mechanisms because of the nature of the mobile network.

GSM Specialised Resource Function (gsmSRF): A functional entity which provides various specialized resources. It interfaces with the gsmSCF and with the MSC. This entity is defined in ITU-T Q.1214 ([6]) with variations defined in the specification.

NA (North American): A prefix attached to certain information items used by North American PLMNs in connection with routing a call to a preferred or dialled long distance carrier.

Location Information: Indicates the location of the served subscriber. The provision of location information is independent of the MS status. As part of the location information, an indication of the age of this information may be delivered.

Originating Basic Call State Model (O-BCSM): The originating half of the BCSM. The O-BCSM corresponds to that portion of the BCSM associated with the originating party.

Originating CAMEL Subscription Information (O-CSI): The O-CSI identifies the subscriber as having originating CAMEL services.

Point In Call (PIC): PICs identify MSC/VLR (GMSC) activities associated with one or more basic call/connection states of interest to OSS service logic instances.

Service Key: The Service Key can identify to the gsmSCF the service logic that it should apply. The Service Key is administered by the HPLMN, and is passed transparently by the VPLMN/IPLMN to the gsmSCF. The Service Key is a part of the T/O-CSI.

Subscriber State: See 3GPP TS 02.78 [2].

Supplementary Service Notification CAMEL Subscription Information (SS-CSI): The SS-CSI identifies the subscriber as having supplementary service invocation notification CAMEL services.

Terminating Basic Call State Model (T-BCSM): The terminating half of the BCSM. The T-BCSM corresponds to that portion of the BCSM associated with the terminating party.

Terminating CAMEL Subscription Information (T-CSI): The T-CSI identifies the subscriber as having terminating CAMEL services.

Translation Information Flag (TIF-CSI) : The TIF-CSI is a flag in the CAMEL subscriber data which indicates that when the subscriber registers a forwarded-to number, that the HLR shall not attempt to perform any translation, number format checks, prohibited FTN checks, call barring checks.

USSD CAMEL Subscription Information (U-CSI) : The U-CSI identifies a set of subscriber specific mappings from a USSD service code to a gsmSCF address.

USSD General CAMEL Service Information (UG-CSI) : The UG-CSI globally identifies a set of mappings from a USSD service code to a gsmSCF address. The global mapping applies to all HPLMN subscribers. If, for a particular service code, both U-CSI and UG-CSI are applicable then the U-CSI shall take precedence.

3.2 Abbreviations

Abbreviations used in the present document are listed in 3GPP TS 01.04 [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
DP	Detection Point
EDP	Event Detection Point
GMSC	Gateway MSC
gsmSCF	GSM Service Control Function
gsmSRF	GSM Specialised Resource Function
gsmSSF	GSM Service Switching Function
HLR	Home Location Register
HPLMN	Home PLMN
IE	Information Element
IF	Information Flow
IP	Intelligent Peripheral
IPLMN	Interrogating PLMN
MSC	Mobile service Switching Centre
NA	North American
O-BCSM	Originating Basic Call State Model
O-CSI	Originating CAMEL Subscription Information
ODB	Operator Determined Barring
OSS	Operator Specific Service
PIC	Point In Call
PLMN	Public Land Mobile Network
SLPI	Service Logic Program Instance
SMF	Service Management Function
SS-CSI	Supplementary Service Notification CAMEL Subscription Information
T-BCSM	Terminating Basic Call State Model
T-CSI	Terminating CAMEL Subscription Information
TDP	Trigger Detection Point
TIF-CSI	Translation Information Flag
U-CSI	USSD CAMEL Subscription Information
UG-CSI	USSD General CAMEL Service Information
VLR	Visitor Location Register
VPLMN	Visited PLMN

4 Architecture

4.1 Functional Entities used for CAMEL

This subclause describes the functional architecture needed to support CAMEL. Also the additions needed to the basic GSM functionality are described. Figure 1 shows the functional entities involved in calls requiring CAMEL support. The architecture is applicable to the second phase of CAMEL.

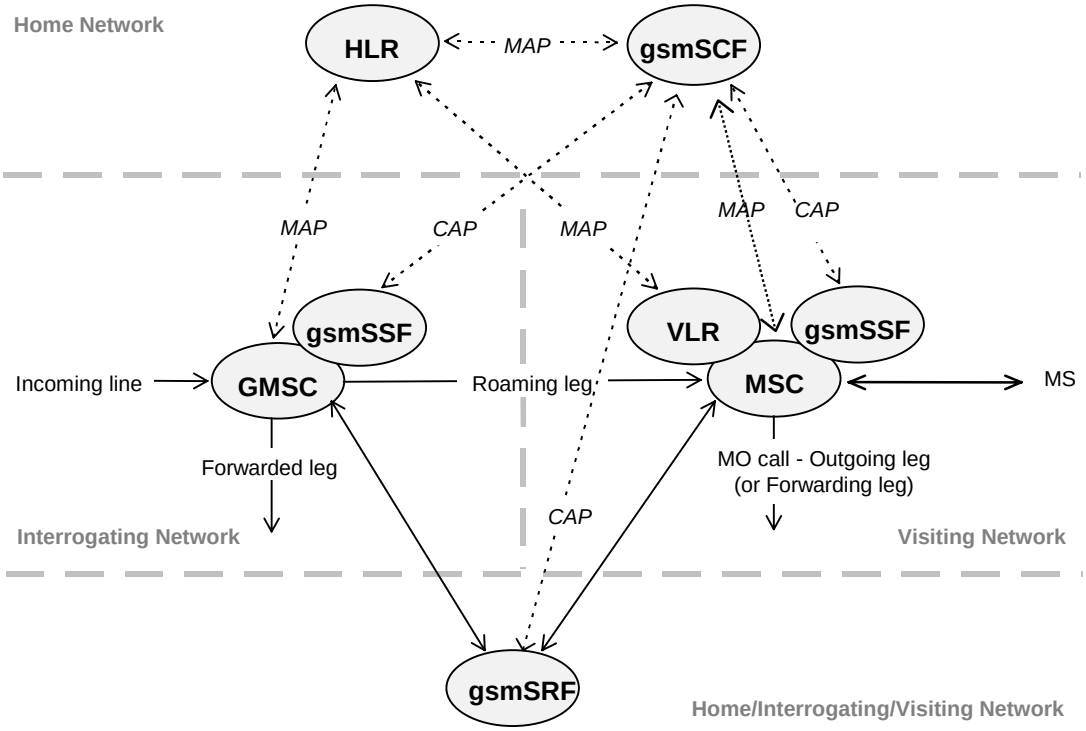

Figure 1: Functional architecture for support of CAMEL

HLR: The HLR stores for subscribers requiring CAMEL support the information relevant to the current subscription regarding O-CSI, T-CSI, TIF-CSI, U-CSI and SS-CSI. The UG-CSI is stored as global data applicable to all CAMEL subscribers. The O-CSI is sent to the VLR in case of Location Update or if the O-CSI is updated. The SS-CSI is sent to the VLR in case of Location Update or if the SS-CSI is updated. The O/T-CSI is sent to the GMSC when the HLR responds to a request for routeing information. The TIF-CSI, U-CSI and the UG-CSI are stored in the HLR only. The HLR may provide an interface towards the gsmSCF for the Any Time Interrogation procedure.

GMSC: When processing the calls for subscribers requiring CAMEL support, the GMSC receives a O/T-CSI from the HLR, indicating the GMSC to request instructions from the gsmSSF. The GMSC monitors on request the call states (events) and informs the gsmSSF of these states during processing, enabling the gsmSSF to control the execution of the call in the GMSC.

MSC: When processing the calls for subscribers requiring CAMEL support, the MSC receives a O-CSI from the VLR indicating the MSC to request instructions from the gsmSSF. The MSC monitors on request the call states (events) and informs the gsmSSF of these states during processing, enabling the gsmSSF to control the execution of the call in the MSC. When processing an invocation of any of the supplementary services ECT, CD and MPTY, the MSC receives a SS-CSI from the VLR, indicating that a notification of the invocation of the supplementary service shall be sent to the gsmSCF.

VLR: The VLR stores the O-CSI and SS-CSI as a part of the subscriber data for subscribers roaming in the VLR area.

gsmSSF: see subclause 3.1.

gsmSCF: see subclause 3.1.

gsmSRF: see subclause 3.1.

4.2 Interfaces defined for CAMEL

This subclause describes the different interfaces applicable to CAMEL. It specifies on a high level the functions specific to CAMEL.

4.2.1 HLR - VLR interface

This interface is used to send the CAMEL related subscriber data to the visited PLMN and for provision of MSRN. The interface is also used to retrieve subscriber status and location information of the mobile subscriber or to indicate suppression of announcement for a CAMEL service.

4.2.2 GMSC - HLR interface

This interface is used at terminating calls to exchange routeing information, subscriber status, location information, subscription information and suppression of announcements. The O/T-CSI that is passed to the IPLMN is sent over this interface.

4.2.3 GMSC - gsmSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of DPs (arming/disarming of DPs, DP processing etc.).

4.2.4 gsmSSF - gsmSCF interface

This interface is used by the gsmSCF to control a call in a certain gsmSSF and to request the gsmSSF to establish a connection with a gsmSRF. Relationships on this interface are opened as a result of the gsmSSF sending a request for instructions to the gsmSCF.

4.2.5 MSC - gsmSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of DPs (arming/disarming of DPs, DP processing etc.).

4.2.6 gsmSCF - HLR interface

This interface is used by the gsmSCF to request information from the HLR. As a network operator option the HLR may refuse to provide the information requested by the gsmSCF.

This interface is also used for USSD operations, both for gsmSCF-initiated dialogues and MS-initiated dialogues (relayed via HLR). It is a network operator option whether to support or not USSD operations on this interface.

4.2.7 gsmSCF - gsmSRF interface

This interface is used by the gsmSCF to instruct the gsmSRF to play tones/announcements to the users.

4.2.8 MSC - gsmSCF interface

This interface is used by the MSC to send supplementary service invocation notifications to the gsmSCF.

5 Detection Points (DPs)

5.1 Definition and description

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. The DPs for Mobile Originated Calls and Mobile Terminated Calls are described in subclauses 7.2 and 7.3.

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. 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 gsmSSF 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 subclauses.

5.1.1 Arming/disarming mechanism

The mechanism by which the DP is armed. A DP may be statically armed or dynamically armed.

The following arming rules apply:

- DP for mobile terminating call handling is statically armed in GMSC as result of T-CSI delivery from HLR. DP for forwarding leg handling is statically armed in GMSC as result of O-CSI delivery from HLR. DP for mobile originating call or forwarded leg handling is statically armed in VMSC as result of O-CSI delivery from VLR.

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

The following disarming rules apply:

- A statically armed DP is disarmed when a O/T-CSI is withdrawn in the 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 is released, then all EDPs related to that call are disarmed.

- If an EDP is met, then other EDPS are disarmed, in accordance with the implicit disarming rule table (see section 7.4).

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

5.1.2 Criteria

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

5.1.2.1 Criteria for a terminating call

The criteria for a terminating call are checked in the HLR. The HLR may store a list of up to 5 basic service codes, each of which may represent an individual basic service or a basic service group. This list is a triggering list. The basic service criterion is met if the basic service for the call matches a stored individual basic service code or is a member of the group defined by a stored basic service group code. For the purpose of this paragraph a general bearer service is a member of the corresponding bearer service group.

The HLR shall include the CAMEL subscription information in the subscriber data sent to the GMSC only if the triggering criteria are met.

5.1.2.2 Criteria for an originating call or a forwarded call

The criteria for an originating or forwarded call are checked in the originating or forwarding MSC.

NOTE: In the case of a forwarded call, the HLR may decide not to include the CAMEL subscription information in the subscriber data sent to the GMSC if the triggering criteria are not met.

The following criteria are applicable for DP2 :

- Destination number triggering criterion: The HLR may store a list of up to 10 destination numbers and/or up to 3 number lengths. The nature of address shall be one of the following:

  - unknown, or

  - international.

  There is no restriction on numbering plan indicator. This criterion may be defined to be either "enabling" or "inhibiting".

- Basic service triggering criterion: The HLR may store a list of up to 5 basic service codes, each of which may represent an individual basic service or a basic service group. This list is a triggering list.

- Forwarding triggering criterion: The HLR may store an indicator that triggering shall occur only for a call which has been subject to GSM or CAMEL call forwarding. This criterion may be defined to be either "enabling" or "inhibiting".

For MO calls, triggering at DP2 shall be strictly based on the number received over the access network.
No service selection information, such as ∗ and # digits, or carrier selection information, dialled by the subscriber, shall be removed from the number before conditional triggering check takes place.

For MF calls at the VMSC, triggering at DP2 shall be strictly based on the number received over the access network (the Deflected-to-Number in case of Call Deflection) or the Forwarded-to-Number retained in the VLR.
No service selection information or carrier selection information shall be removed from the number before conditional triggering check takes place.

For MF calls at the GMSC, triggering at DP2 shall be strictly based on the Forwarded-to-Number received from HLR or on the Destination Routing Address received in the Connect operation from SCF during a Terminating CAMEL Service.

No service selection information or carrier selection information shall be removed from the number before conditional triggering check takes place.

One or more DP criteria may be applicable. All applicable triggering criteria must be satisfied before the dialogue is established with the gsmSCF.

If the destination number triggering criterion is enabling, then the gsmSSF 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 gsmSSF 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.

The basic service triggering criterion is met if the basic service for the call matches a stored individual basic service code or is a member of the group defined by a stored basic service group code. For the purpose of this paragraph a general bearer service is a member of the corresponding bearer service group.

If the forwarding triggering criterion is enabling, then the gsmSSF may establish a dialogue with the gsmSCF only if the call has been subject to CAMEL or GSM call forwarding. If the forwarding triggering criterion is inhibiting, then the gsmSSF may establish a dialogue with the gsmSCF only if the call has not been subject to CAMEL or GSM call forwarding.

5.1.3 Relationship

Given that an armed DP was encountered, the gsmSSF provides an information flow via a relationship.

A relationship between the gsmSSF and the gsmSCF for the purpose of operator specific service processing is considered to be a CAMEL relationship. There are two types of CAMEL relationships:

- A CAMEL control relationship if the gsmSCF is able to influence the call processing via the relationship.
- A CAMEL monitor relationship if the gsmSCF is not able to influence the call processing via the relationship.

5.2 DP processing rules

The gsmSSF shall apply the following set of rules during DP processing to ensure a single point of control:

- EDPs are disarmed by the gsmSSF as they are encountered and reported to the gsmSCF, when the occurrence of another EDP causes the implicit disarming of the EDP or when the leg clears.
- A control relationship persists as long as there is 1 or more EDP-R armed for this portion of the call or if the gsmSSF is in any state except Monitoring or Idle.
- A control relationship changes to a monitor relationship if the control relationship does not persist and :
  - 1 or more EDP-N armed, or

- 1 or more Call information Report outstanding, or
- an Apply Charging Report outstanding.

- A control relationship terminates if it does not persist and does not change to a monitor relationship. A monitor relationship terminates if there are neither EDP-Ns armed nor reports outstanding or if the call clears.

6 Description of CAMEL Subscriber Data

6.1 Originating/Terminating CAMEL Subscription Information (O/T-CSI)

This subclause defines the contents of the Originating/Terminating CAMEL Subscription Information.

6.1.1 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.

6.1.2 Service Key

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

6.1.3 Default Call Handling

The Default Call Handling indicates whether the call shall be released or continued as requested in case of error in the gsmSSF to gsmSCF dialogue.

6.1.4 TDP List

The TDP List indicates on which detection point triggering shall take place. For O-CSI only DP2 is used. For T-CSI only DP12 is used.

6.1.5 DP criteria

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

6.1.6 CAMEL Capability Handling

CAMEL Capability Handling indicates the phase of CAMEL which is asked by the gsmSCF for the service. The HLR shall not include in a CSI which it sends to a VLR or GMSC any data for a CAMEL phase later than that which the CAMEL capability handling indicates. E.g. if the CAMEL Capability Handling indicates CAMEL phase 1 then the HLR shall not send triggering criteria to the VLR. Different CSIs may contain different values of CAMEL Capability Handling.

NOTE: If CAMEL is not supported or if a lower phase of CAMEL is supported in the VLR, the HLR can decide on a subscriber basis to apply ODB, perform normal call handling or perform operator specific handling (eventually support of a lower version of CSI).

6.2 Other CAMEL data

6.2.1 USSD CAMEL Subscription Information (U-CSI)

The subscription information specified in this subclause is for information only.

This subclause defines the contents of the USSD CAMEL Subscription Information (U-CSI). The U-CSI consists of a list of pairs of the following two parameters.

6.2.1.1 Service Code

Service code for a specific application in a gsmSCF which interacts with the user by USSD.

6.2.1.2 gsmSCF address

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

6.2.2 Supplementary Service Invocation Notification CAMEL Subscription Information (SS-CSI)

6.2.2.1 Content of the SS-CSI

This subclause defines the contents of the Supplementary Service Invocation Notification CAMEL Subscription Information (SS-CSI).

6.2.2.1.1 Notification criteria

This data indicates for which supplementary services notifications shall be sent. The supplementary services which may be indicated are ECT, CD and MPTY.

6.2.2.1.2 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.

6.2.3 Location information/Subscriber state Interrogation

This data indicates whether additional subscriber information shall be sent to the GMSC as part of the terminating call handling.

- an indication that the HLR shall send the location information of the called subscriber.
- an indication that the HLR shall send the subscriber state of the called subscriber.

6.2.4 Translation Information Flag (TIF-CSI)

A flag (TIF-CSI) in the CAMEL Subscriber data in the HLR indicates, when the subscriber registers a forwarded-to number, that the HLR shall not attempt to perform any translation, number format checks, prohibited FTN checks, call barring checks (cf. 10.2).

If the flag is absent, this indicates that a translation is needed in the HLR and the usual procedure applies as defined in the current version of TS 3GPP TS 03.82 [13]. In particular, the interaction with barring services shall be performed by the HLR at the registration of the FTN.

7 Description of CAMEL BCSMs

7.1 General Handling

The BCSM is used to describe the actions in an MSC/GMSC during originating, forwarded or terminating calls.

The BCSM identifies the points in basic call processing when Operator Specific Service (OSS) logic instances (accessed through the gsmSCF) are permitted to interact with basic call control capabilities.

Figure 2 shows the components that have been identified to describe a BCSM.

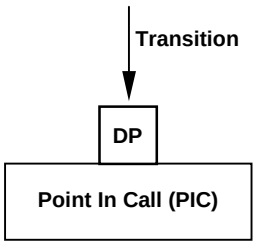

Figure 2: BCSM Components

7.2 Originating Basic Call State Model (O-BCSM)

7.2.1 Description of O-BCSM

The O-BCSM is used to describe the actions in an MSC during originating (MSC) or forwarded (MSC or GMSC) calls.

When encountering a DP the O-BCSM processing is suspended at the DP and the MSC/GMSC indicates this to the gsmSSF which determines what action, if any, shall be taken in case the DP is armed.

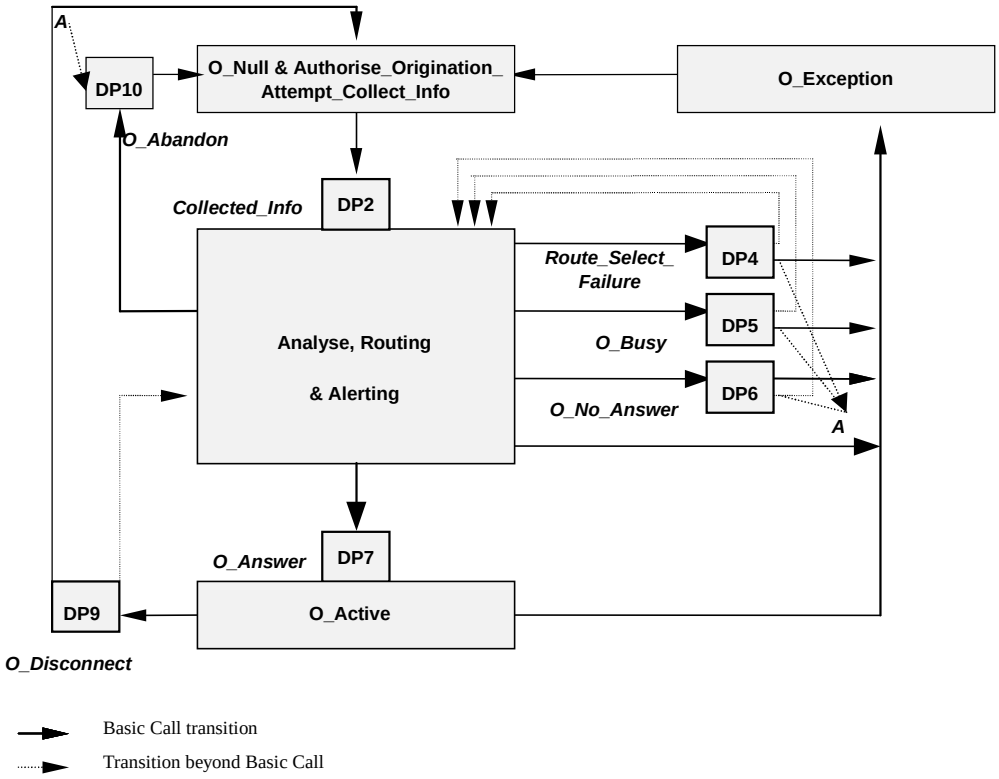

Figure 3: Originating BCSM for CAMEL

The following table defines the different DPs which apply to mobile originating and forwarded calls.

Table 1: Description of O-BCSM DPs in the MSC

CAMEL Detection Point:	DP Type	Description:
DP2 Collected_Info	TDP-R	Indication that the O-CSI is analysed.
DP 4 Route_Select_Failure	EDP-N, EDP-R	Indication that the call establishment failed
DP 5 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 cause IE in the ISUP release message.
DP6 O_No_Answer	EDP-N, EDP-R	Indication that an application timer associated with the O_No_Answer DP expires
DP7 O_Answer	EDP-N, EDP-R	Indication that the call is accepted and answered by the terminating party.
DP9 O_Disconnect	EDP-N, EDP-R	A disconnect indication is received from the originating party or from the terminating party.
DP 10 O_Abandon	EDP-N	Indication that a disconnect indication is received from the originating party during the call establishment procedure

NOTE: the DPs 2, 4, 5, 6, 7, 9, 10 are defined in ITU-T Q.1214 ([6]).

7.2.1.1 Description of the call model (PICs)

This subclause describes the call model for originating and forwarded calls. For each PIC a description can be found of the entry events, functions and exit events.

It should be noted that although the names used for PICs match those used in ITU-T Q.1214 [6] the specific descriptions differ.

7.2.1.1.1 O_Null & Authorise_Origination_Attempt_Collect_Info

Entry events:

- Disconnection and clearing of a previous call (DP9 - O_Disconnect) or default handling of exceptions by gsmSSF/(G)MSC completed.
- Abandon event is reported from Analyse, Routing and Alerting PIC.
- Exception event is reported.

Functions:

- Interface is idled.
- Originating call: SETUP message containing the dialled number is received from MS.
- Originating call: The supplementary service "barring of all outgoing calls" is checked and invoked if necessary.
- Originating call: The ODB category "barring of all outgoing calls" is checked and ODB is invoked if necessary.

NOTE: the ODB category "barring of all outgoing calls when roaming" causes the HLR to send the category "barring of all outgoing call" if the VLR is not in the HPLMN.

- Originating call: CUG checks done in the originating MSC/VLR are performed.
- Information being analysed e.g., O-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.

7.2.1.1.2 Analyse, Routing & Alerting

Entry events:

- Originating CSI is analysed. (DP2 - Collected Info).
- Busy event, Route Select Failure event event or No Answer event is reported from Analyse Routing and Alerting PIC.
- Disconnect event is reported from O_Active PIC.

Functions:

- Information being analysed and/or translated according to dialling plan to determine routeing address.
- Routeing address being interpreted.
- Originating call: Outgoing barring services and ODB categories not already applied are checked and invoked if necessary.
- Call is being processed by the terminating half BCSM. Continued processing of call 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. (DP7 - 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.

7.2.1.1.3 O_Active

Entry events:

- Indication from the terminating half BCSM that the call is accepted and answered by the terminating party. (DP7 - O_Answer)

Functions:

- Connection established between originating party and terminating party. Call supervision is provided.
- 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. (DP9 - O_Disconnect)
- An exception condition is encountered.

7.2.1.1.4 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.

Functions:

- 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 gsmSSF and the gsmSCF send an error information flow closing the relationships and indicating that any outstanding call handling instructions will not run to completion
  - The (G)MSC/gsmSSF should make use of vendor-specific procedures to ensure release of resources within the (G)MSC/gsmSSF, so that line, trunk and other resources are made available for new calls.

Exit events:

- Default handling of the exception condition by gsmSSF/(G)MSC completed.

7.3 Terminating Basic Call State Model (T-BCSM)

7.3.1 Description of T-BCSM

The T-BCSM is used to describe the actions in a GMSC during terminating calls.

When encountering a DP the T-BCSM processing is suspended at the DP and the GMSC indicates this to the gsmSSF which determines what action, if any, shall be taken in case the DP is armed.

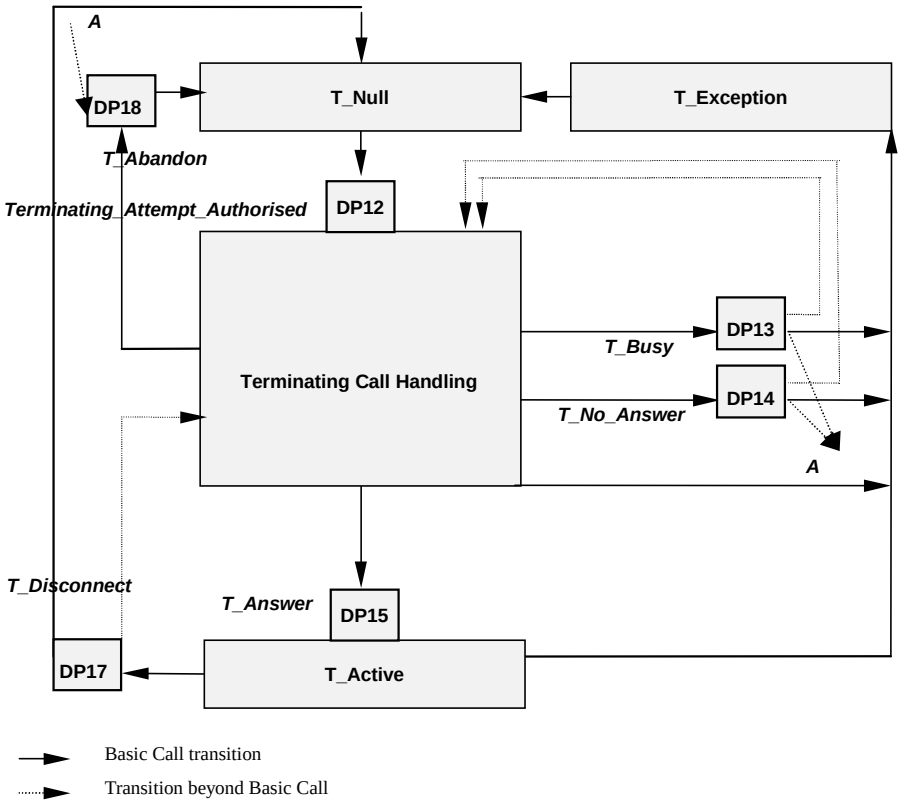

Figure 4: T-BCSM in the GMSC

In the following table the different DPs (in the T-BCSM) are described.

Table 2: Description of T-BCSM DPs in the GMSC

CAMEL Detection Point:	DP Type	Description:
DP12 Terminating_Attempt_Authorised	TDP-R	Indication that the T-CSI is analysed.
DP 13 T_Busy	EDP-N, EDP-R	Indication that: - a busy indication is received from the destination exchange, - Not reachable or call establishment failure event is determined from the HLR response or upon a cause IE in the ISUP release message.
DP 14 T_No_Answer	EDP-N, EDP-R	Indication that an application timer associated with the T_No_Answer DP expires
DP15 T_Answer	EDP-N, EDP-R	Call is accepted and answered by terminating party
DP17 T_Disconnect	EDP-N, EDP-R	A disconnect indication is received from the terminating party or from the originating party.
DP 18 T_Abandon	EDP-N	A disconnect indication is received from the originating party during the call establishment procedure

NOTE: The DPs 12, 13, 14, 15, 17, 18 are defined in ITU-T Q.1214 ([6]).

7.3.1.1 Description of the call model (PICs)

This subclause describes the call model for terminating calls in the GMSC. For each PIC a description can be found of the entry events, functions, information available and exit events.

It should be noted that although the names used for PICs match those used in ITU-T Q.1214 [6] the specific descriptions differ.

7.3.1.1.1 T_Null

Entry events:

- Disconnection and clearing of a previous call (DP 17) or default handling of exceptions by gsmSSF/GMSC completed.
- Abandon event is reported from Terminating Call Handling PIC ;
- Exception event is reported.

Functions:

- Interface is idled.
- ISUP_IAM is received, the appropriate information is analysed.
- Send_Routeing_Info information flow is sent to HLR.
- The supplementary services "barring of all incoming calls" and "barring of incoming calls when roaming" are checked and invoked if necessary.
- The ODB categories "barring of all incoming calls" and "barring of incoming calls when roaming" are checked and ODB is invoked if necessary.
- The supplementary service "CUG" is checked and invoked if necessary.
- T-CSI is received and analysed.

Exit events:

- Response is received from HLR and terminating CSI (if available) 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.

7.3.1.1.2 Terminating Call Handling

Entry events:

- Response is received from HLR and terminating CSI (if available) is analysed. (DP 12 Terminating_Attempt_Authorised),
- Busy event or No Answer event is reported from Terminating Call Handling PIC,
- Disconnect event is reported from T_Active PIC.
- The terminating party is not reachable.

NOTE: The HLR may use MAP signalling to indicate to the GMSC before the call is extended to the destination VMSC that the terminating party is not reachable, or the destination VMSC may use telephony signalling to indicate to the GMSC after the call has been extended to the destination VMSC that the terminating party is not reachable.

Functions:

- The response from HLR is analysed.
- Routeing address and call type being interpreted. The next route is being selected.
- The terminating party is being alerted. Waiting for the call to be answered by terminating party.
- The GSM supplementary service call forwarding is invoked if necessary.

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 call setup to the MSC/GMSC was not successful.
- Calling party abandons the call - this leads to the T_Abandon DP.
- A busy indication is received from the destination exchange - this leads to the T_Busy DP.
- Not reachable event detected or failure of attempt to select the route for the terminating leg - 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.

7.3.1.1.3 T_Active

Entry events:

- Indication that the call is accepted and answered by the terminating party. (DP15 - T_Answer)

Functions:

- Connection established between originating party and terminating party. Call supervision is being provided.
- 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. (DP17 - 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.

7.3.1.1.4 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.

Functions:

- 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 gsmSSF and the gsmSCF send an error information flow closing the relationships and indicating that any outstanding call handling instructions will not run to completion
  - The GMSC/gsmSSF should make use of vendor-specific procedures to ensure release of resources within the GMSC/gsmSSF, so that line, trunk and other resources are made available for new calls.

Exit events:

- Default handling of the exception condition by gsmSSF/GMSC completed.

7.4 Rules for Implicit Disarming of Detection Points

The following tables give the rules for implicit disarming of event detection points.

The table entry 'X' means that if one DP occurs (independently of arming and reporting to the gsmSCF) the marked one is implicitly disarmed.

It shall be possible to rearm explicitly an implicitly disarmed DP, e.g. for follow on call.

Table 3: Implicit disarmed DPs in the O-BCSM

Encountered DP	Implicit disarmed DPs						
	DP4	DP 5	DP 6	DP 7	DP 9 leg 1	DP 9 leg 2	DP 10
DP4 Route_Select_Failure	X	X	X	X		X	
DP5 O_Busy	X	X	X	X		X	
DP6 O_No_Answer	X	X	X	X		X	
DP7 O_Answer	X	X	X	X			X
DP9 O_Disconnect leg 1					X		X
DP9 O_Disconnect leg 2	X	X	X	X		X	
DP10 O_Abandon					X		X

Table 4: Implicit disarmed DPs in the T-BCSM

Encountered DP	Implicit disarmed DPs					
	DP 13	DP 14	DP 15	DP 17 leg 1	DP 17 leg 2	DP 18
DP13 T_Busy	X	X	X		X	
DP14 T_No_Answer	X	X	X		X	
DP 15 T_Answer	X	X	X			X
DP 17 T_Disconnect leg 1				X		X
DP 17 T_Disconnect leg 2	X	X	X		X	
DP18 T_Abandon				X		X

7.5 BCSM Modelling of Call Scenarios

This subclause describes how the BCSMs defined above are used to model GSM call scenarios. For each scenario the used and unused BCSMs involved in the call are shown.

In some cases these models may have an allocation to physical nodes different from that shown. However, the physical separation of the logic functions shown shall not impact the modelling. This subclause describes the call scenarios without optimal routeing. If optimal routeing is invoked the physical configurations may be different from those shown, but the modelling is not changed.

CAMEL may be applied simultaneously and independently for each GSM subscriber involved in a call. This is not shown in these scenarios.

Subscribers other than those being served by CAMEL may be either PSTN subscribers, other GSM subscribers or any other addressable subscriber.

7.5.1 Mobile Originated Call

The O-BCSM for the call from A to B (labelled "O(A-B)") is invoked if the A-party has an active O-CSI. A control relationship with gsmSCF (1) will be created.

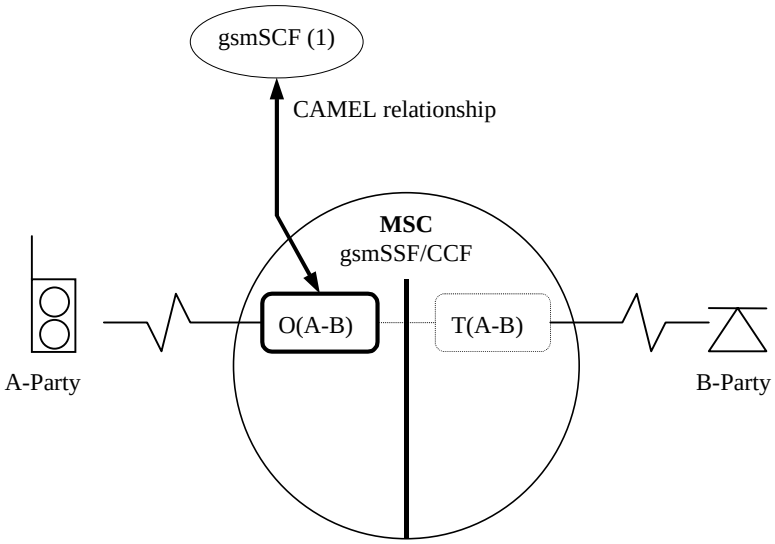

Figure 5: BCSM Scenario for Mobile Originated Call

7.5.2 Mobile Terminated Call

The T-BCSM for the call from A to B (labelled "T(A-B)") is invoked if the B-party has an active T-CSI. A control relationship with gsmSCF (1) will be created.

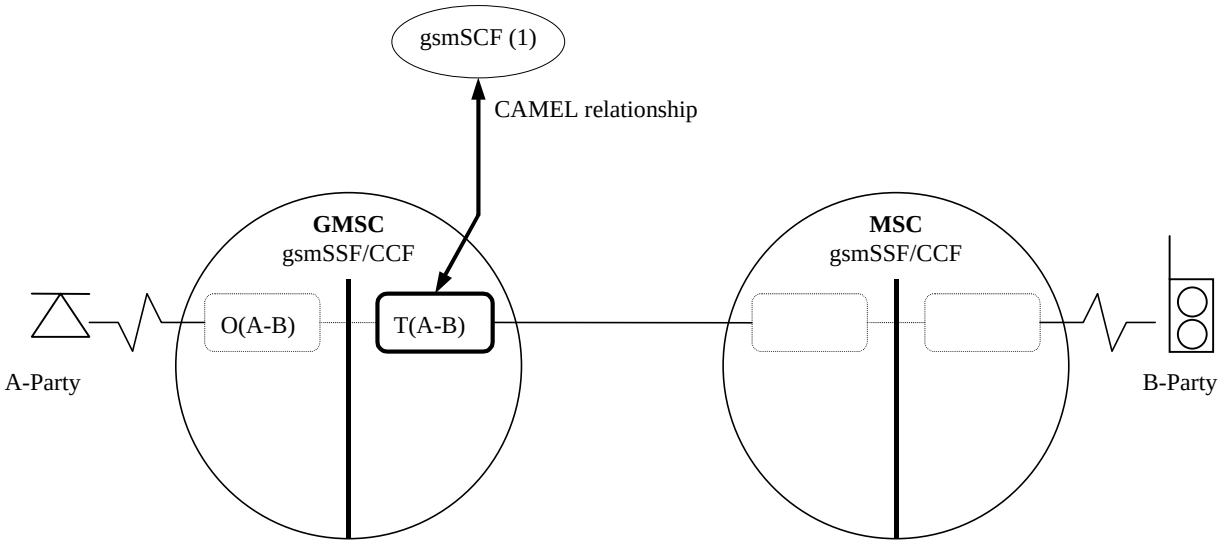

Figure 6: BCSM Scenario for Mobile Terminated Calls

7.5.3 Call Forwarding at the GMSC

The T-BCSM for the call from A to B (labelled "T(A-B)") is invoked if the B-party has an active T-CSI. A control relationship with gsmSCF (1) will be created.

A new call leg to a "C" party is created if:

- a GSM call forwarding supplementary service forwards the call to C. In this case O-BCSM O(B-C) is always invoked for the forwarding party if an O-CSI has been received by the GMSC from the HLR; or

- a CAMEL service in a control relationship with T(A-B) performs a CAMEL-based call forwarding by using a Connect information flow containing the forwarding information. In this case O-BCSM O(B-C) is only invoked for the forwarding party if an O-CSI has been received by the GMSC from the HLR and " O-CSI Applicable" flag is contained in the Connect information flow.

A control relationship with gsmSCF (2) will be created.

The relationships with gsmSCF (1) and gsmSCF(2) may exist simultaneously. The two relationships are treated independently at the GMSC. The BCSM T(A-B) and BCSM O(B-C) are linked by an internal interface which is assumed to behave in a similar way to an ISUP interface.

The nodes gsmSCF (1) and gsmSCF (2) may be the same or different physical entities.

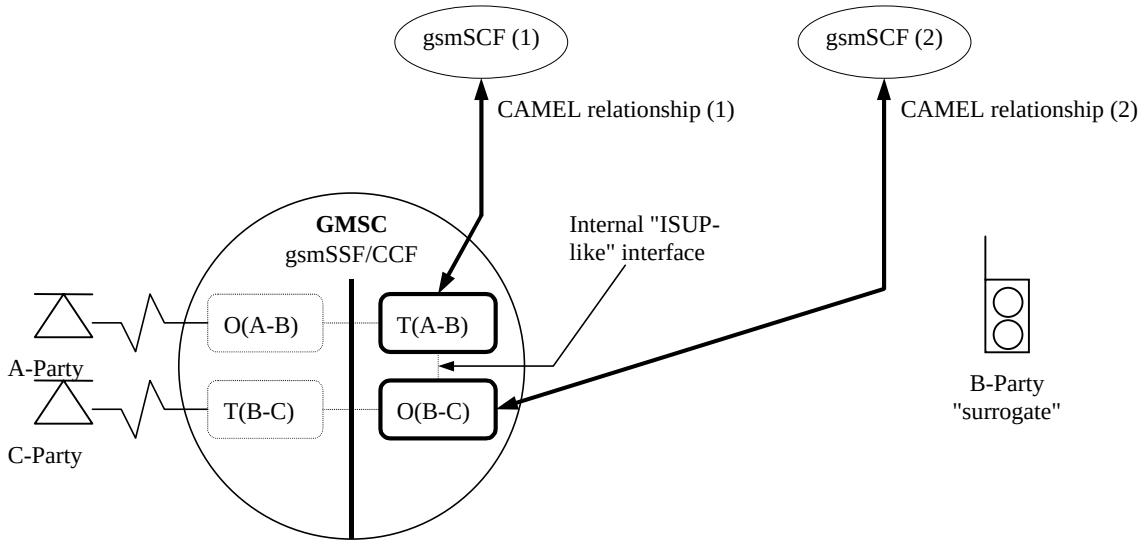

Figure 7: BCSM Scenario for Call Forwarding at the GMSC

7.5.4 Call Forwarding at the MSC

The T-BCSM for the call from A to B (labelled "T(A-B)") is invoked if the B-party has an active T-CSI. A control relationship with gsmSCF (1) will be created. Following processing at the GMSC the call will be extended to the MSC serving the B-party. This MSC may be physically integrated with the GMSC, but it is shown as being separate in the diagram below.

If a GSM call forwarding supplementary service acting at the MSC forwards the call to C, a new call leg to C is established. If the B-party has an active O-CSI, the BCSM O(B-C) is invoked. A control relationship with gsmSCF (2) will be created.

The relationships with gsmSCF (1) and gsmSCF(2) may exist simultaneously.

The nodes gsmSCF (1) and gsmSCF (2) may be the same or different physical entities.

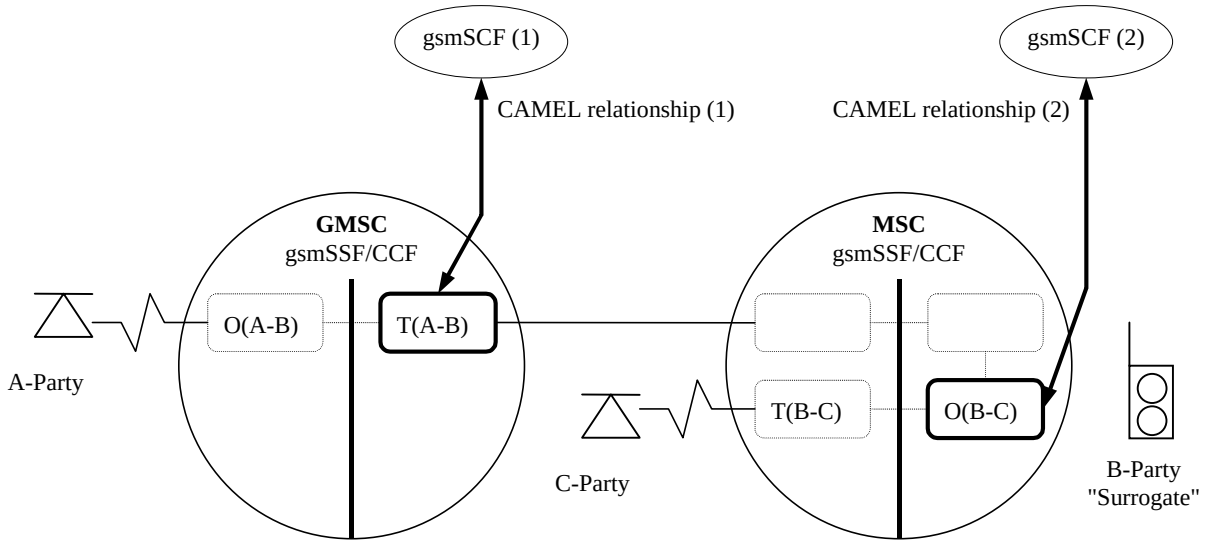

Figure 8: BCSM Scenario for Call Forwarding at the MSC

8 Procedures for CAMEL

The SDLs in this specification illustrate how CAMEL modifies the normal call handling. They do not attempt to show all the details of call handling in nodes that support CAMEL. Relevant parts of 3GPP TS03.18 [3] apply in addition to these SDLs. For example, some inputs leading to unsuccessful call attempts are not shown on these diagrams - corresponding clauses in 3GPP TS03.18 [3] apply.

Note that in some SDL processes and procedures the Release message may be sent on both an access interface and an inter-switch interface. If the message is sent on a UNI, its effect is the same as a Release transaction message.

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.

In the following SDLs, the term SRF is used for gsmSRF.

8.1 Overall SDL architecture

The following diagram shows the overall architecture for the SDL diagrams.

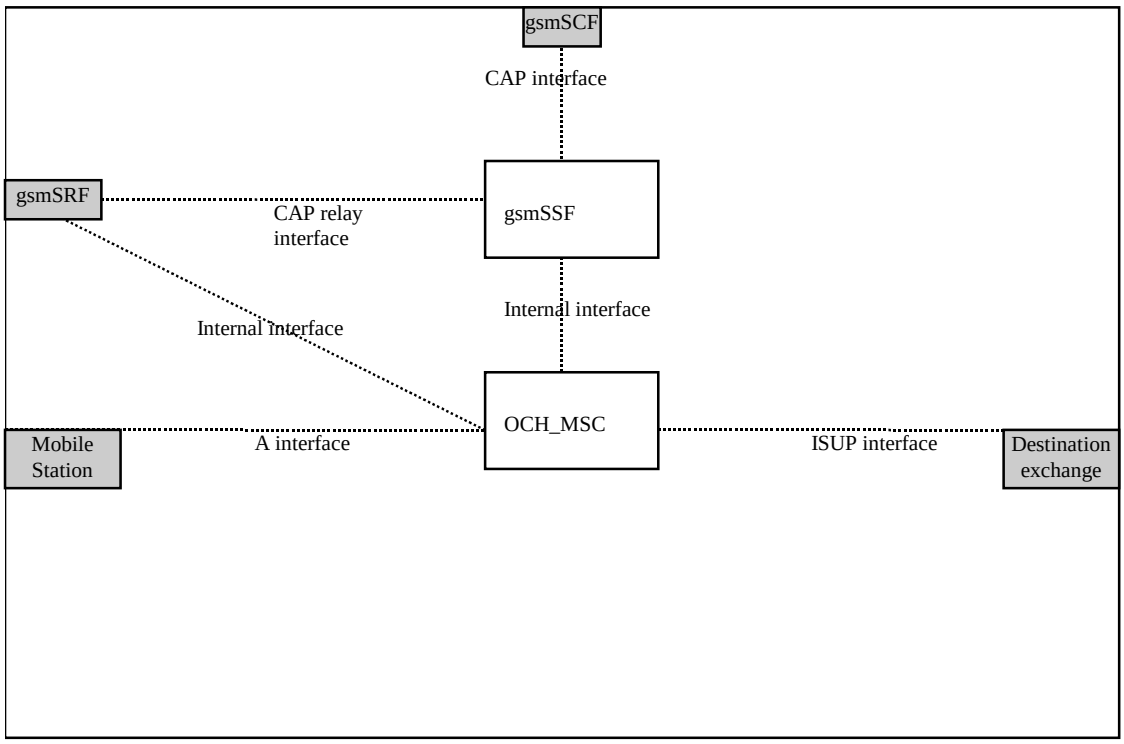

Figure 9a: Outgoing case (gsmSSF relay)

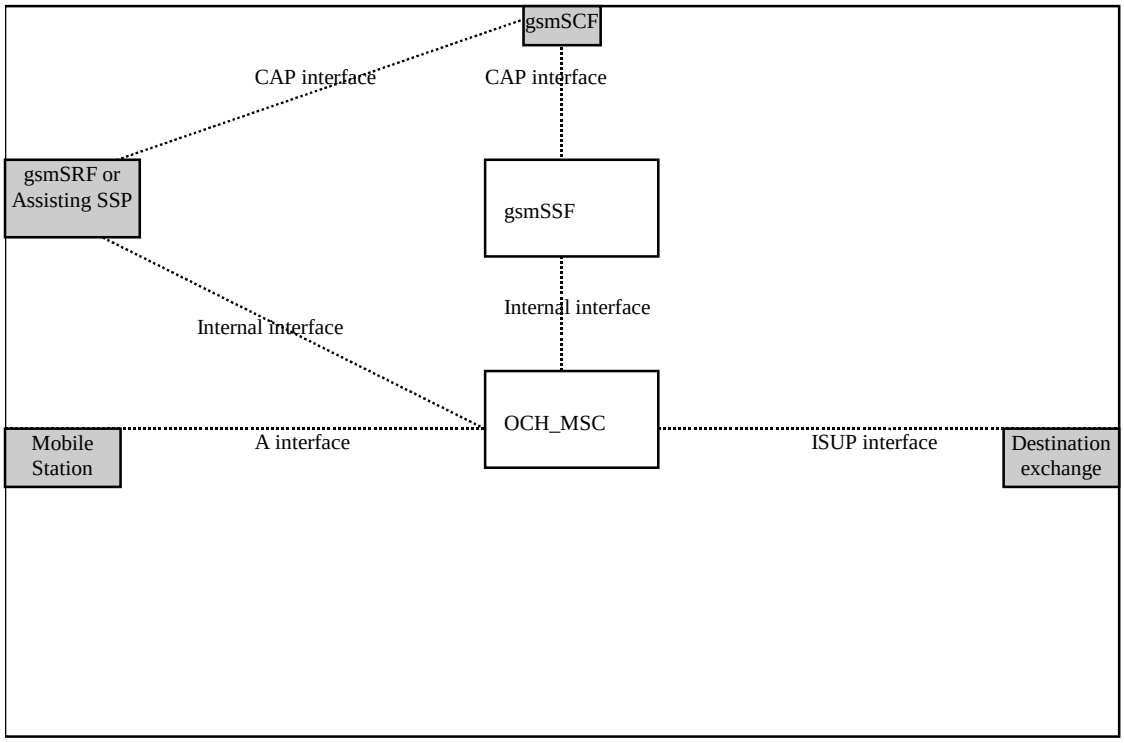

Figure 9b: Outgoing case (direct path gsmSCF to gsmSRF or assist with relay)

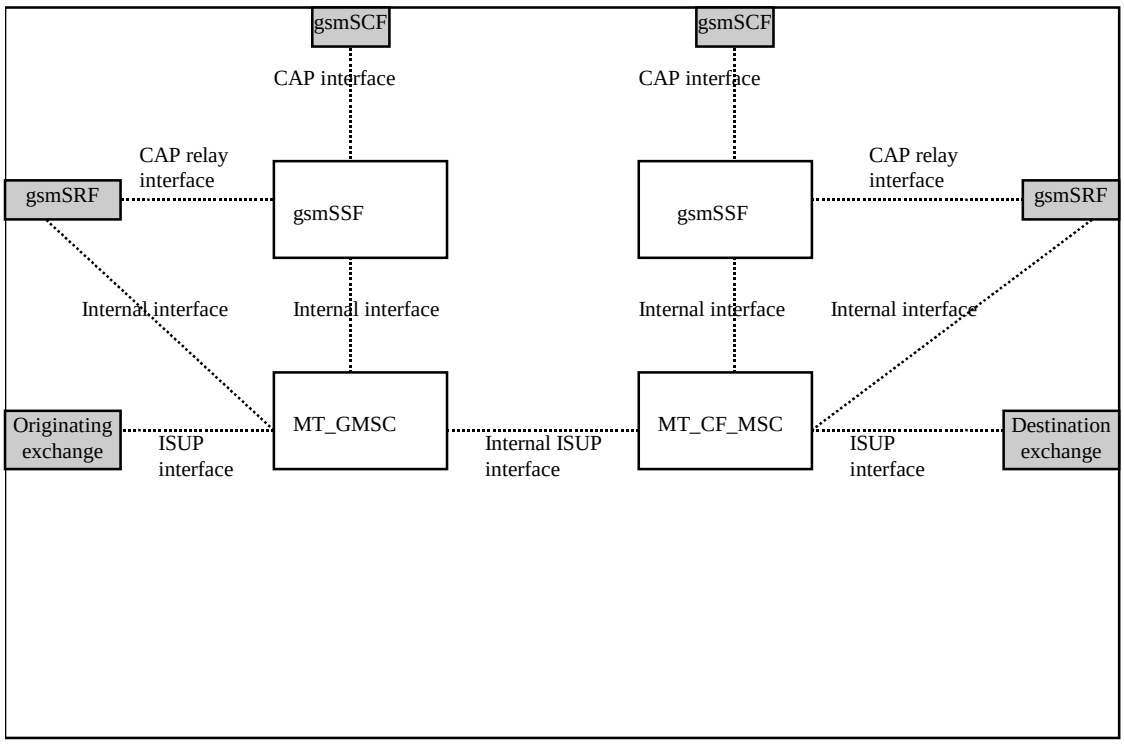

Figure 9c: Terminating case (gsmSSF relay)

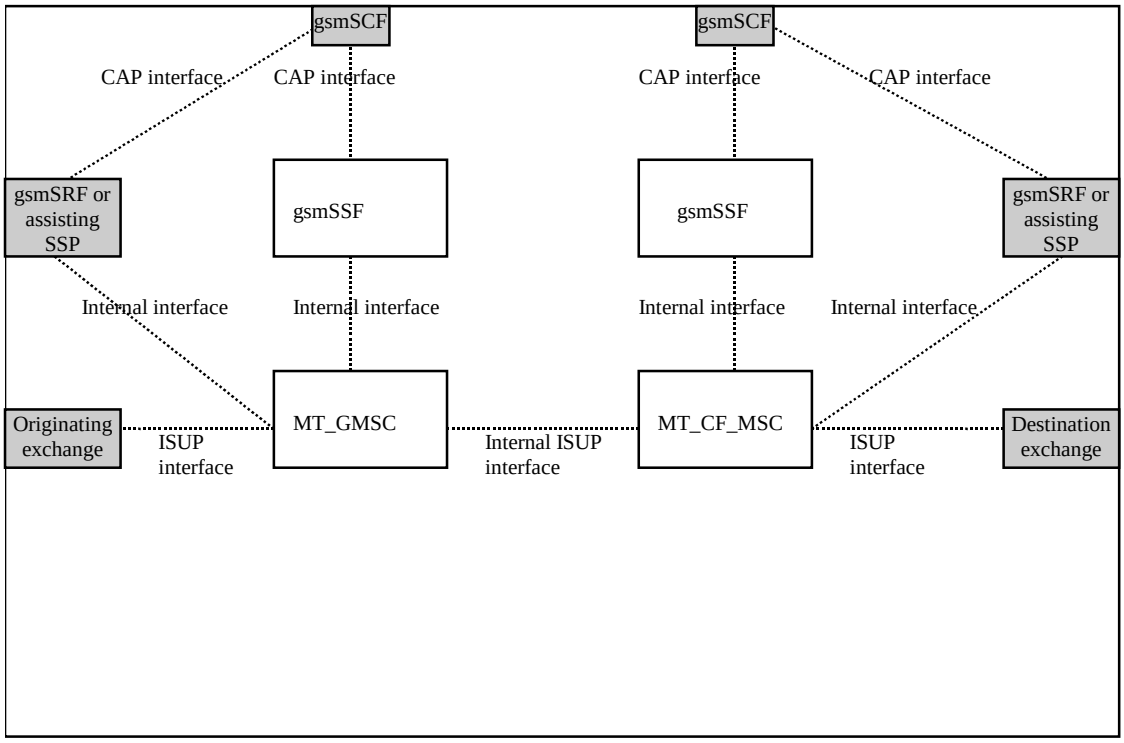

Figure 9d: Terminating case (direct path gsmSCF to gsmSRF or assist with relay)

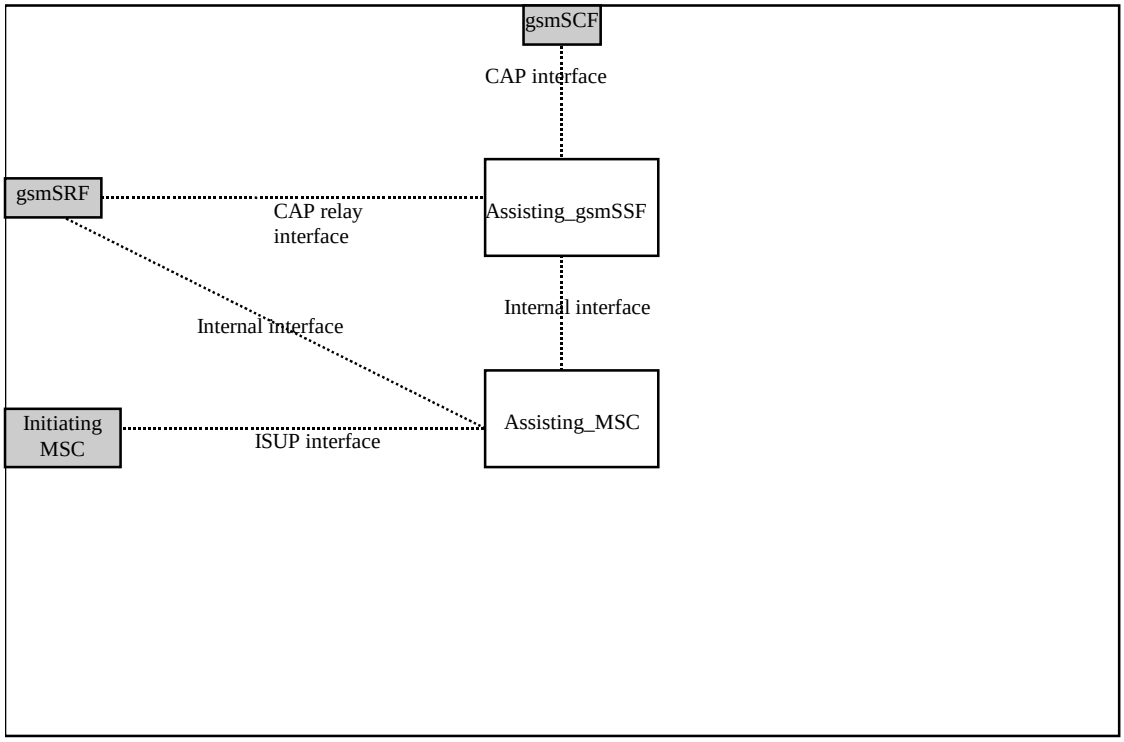

Figure 9e: Assisting case

8.2 Handling of mobile originated calls

8.2.1 Handling of mobile originated calls in the originating MSC

The functional behaviour of the originating VMSC is specified in 3GPP TS03.18 [3]. The procedures specific to CAMEL are specified in this subclause:

- Procedure CAMEL_OCH_MSC_INIT,
- Procedure CAMEL_OCH_MSC_ANSWER,
- Procedure CAMEL_OCH_MSC1,
- Procedure CAMEL_OCH_MSC2,
- Procedure CAMEL_OCH_MSC_DISC1,
- Procedure CAMEL_OCH_MSC_DISC2,
- Procedure CAMEL_OCH_MSC_DISC4,
- Procedure CAMEL_OCH_ETC,
- Procedure CAMEL_OCH_CTR,
- Procedure CAMEL_Start_TNRy,
- Procedure CAMEL_Stop_TNRy.

The procedure Send_Access_Connect_If_Required is specified in 3GPP TS03.18 [3].

The following paragraphs gives details on the behaviour of the MSC in the procedure CAMEL_OCH_MSC_INIT.

8.2.1.1 Actions of the MSC on receipt of Int_Error

The MSC checks the default Call Handling parameter in O-CSI.

If the default call handling is release call, a Release is sent to the MS and an Abort to the VLR. The MSC then releases all call resources and the procedure CAMEL_OCH_MSC_INIT ends.

If the default call handling is continue call, the MSC continues processing without CAMEL support. It sends Send_Info_For_Ougoing_Call to the VLR and waits in state Wait_For_MO_Call_Result.

8.2.1.2 Actions of the MSC on receipt of Int_Continue

The MSC continues processing without any modification of call parameters. It sends Send_Info_For_Ougoing_Call to the VLR and waits in state Wait_For_MO_Call_Result.

8.2.1.3 Actions of the MSC on receipt of Int_Connect

The MSC continues processing with modified call parameters. The MSC shall transparently modify the call parameters with the received information. The MSC then sends a PROGRESS message to the MS. Call parameters which are not included in the Int_Connect message are unchanged.

Signalling limitations or regulatory requirements may require the Calling Partys Category, Generic Number, Original Called Party Number and Redirecting Party ID to be ignored or modified.

The network signalling system shall indicate that this is an internal network number.

The MSC sets the O-CSI suppression parameter, sends a Send Info For Outgoing Call to the VLR and waits in state Wait_For_MO_Call_Result.

8.2.1.4 Actions of the MSC on receipt of Int_Release_Call

A Release is sent to the MS, an abort to the VLR and a Release is sent to the destination exchange. The release cause received in the Int_Release_Call is used. The MSC then releases all call resources and the procedure CAMEL_OCH_MSC_INIT ends.

8.2.1.5 Action of the MSC in procedure CAMEL_OCH_ETC

In procedure CAMEL_OCH_ETC (sheet 2) the MSC will remain in the Wait_For_Assisting_Answer state until it receives an ISUP Answer Message (ANM) or timeout occurs. This is to ensure that a call record is always generated for every successful establishment of a temporary connection to a gsmSRF, especially in the case where the connection is between PLMNs.

NOTE: This means that it may not be possible to access an SRF which does not generate an ISUP Answer Message (ANM).

If a Progress message is sent towards the MS the progress indicator shall indicate "In Band Information".

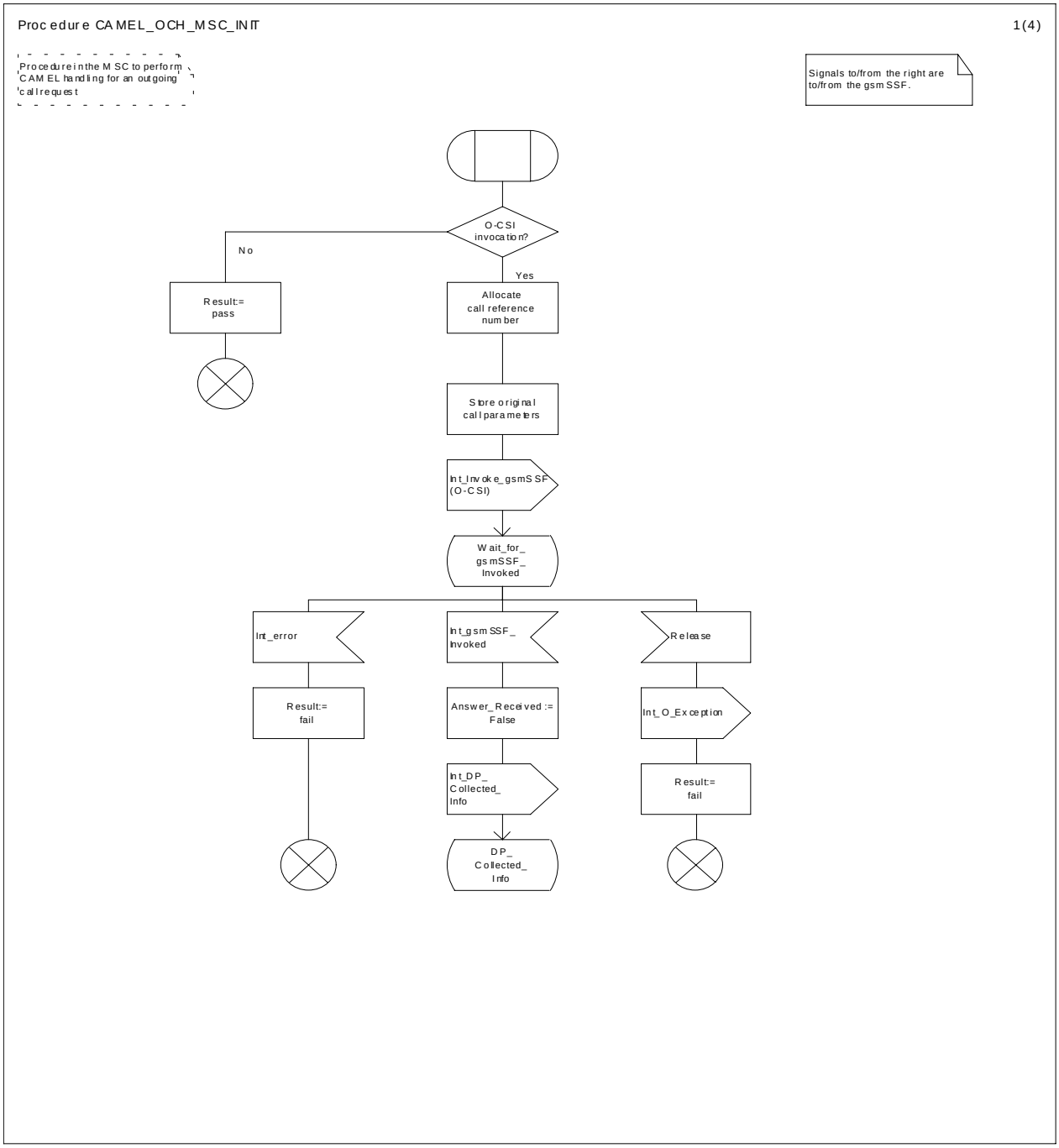

Figure 10a: Procedure CAMEL_OCH_MSC_INIT (sheet 1)

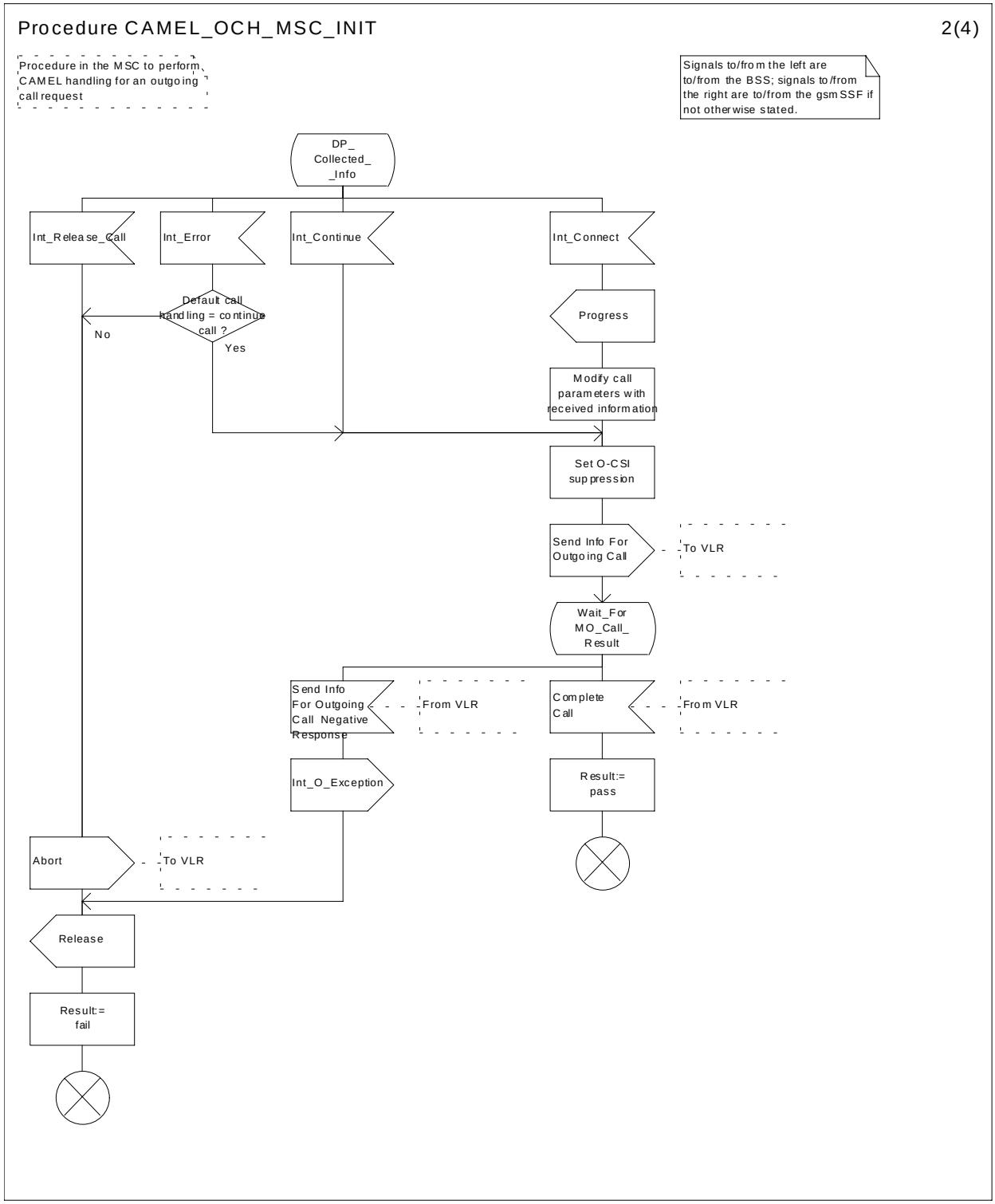

Figure 10b: Procedure CAMEL_OCH_MSC_INIT (sheet 2)

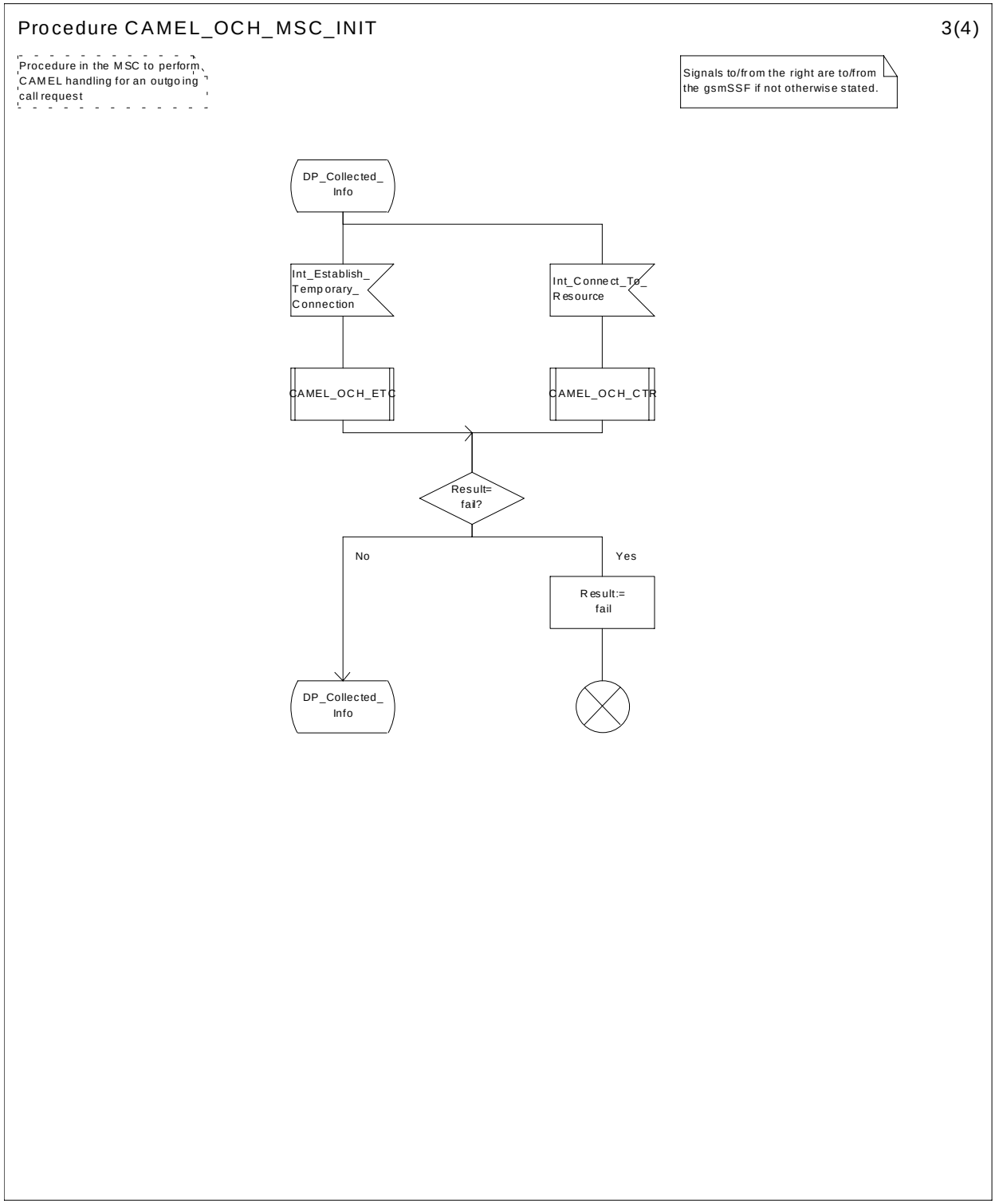

Figure 10c: Procedure CAMEL_OCH_MSC_INIT (sheet 3)

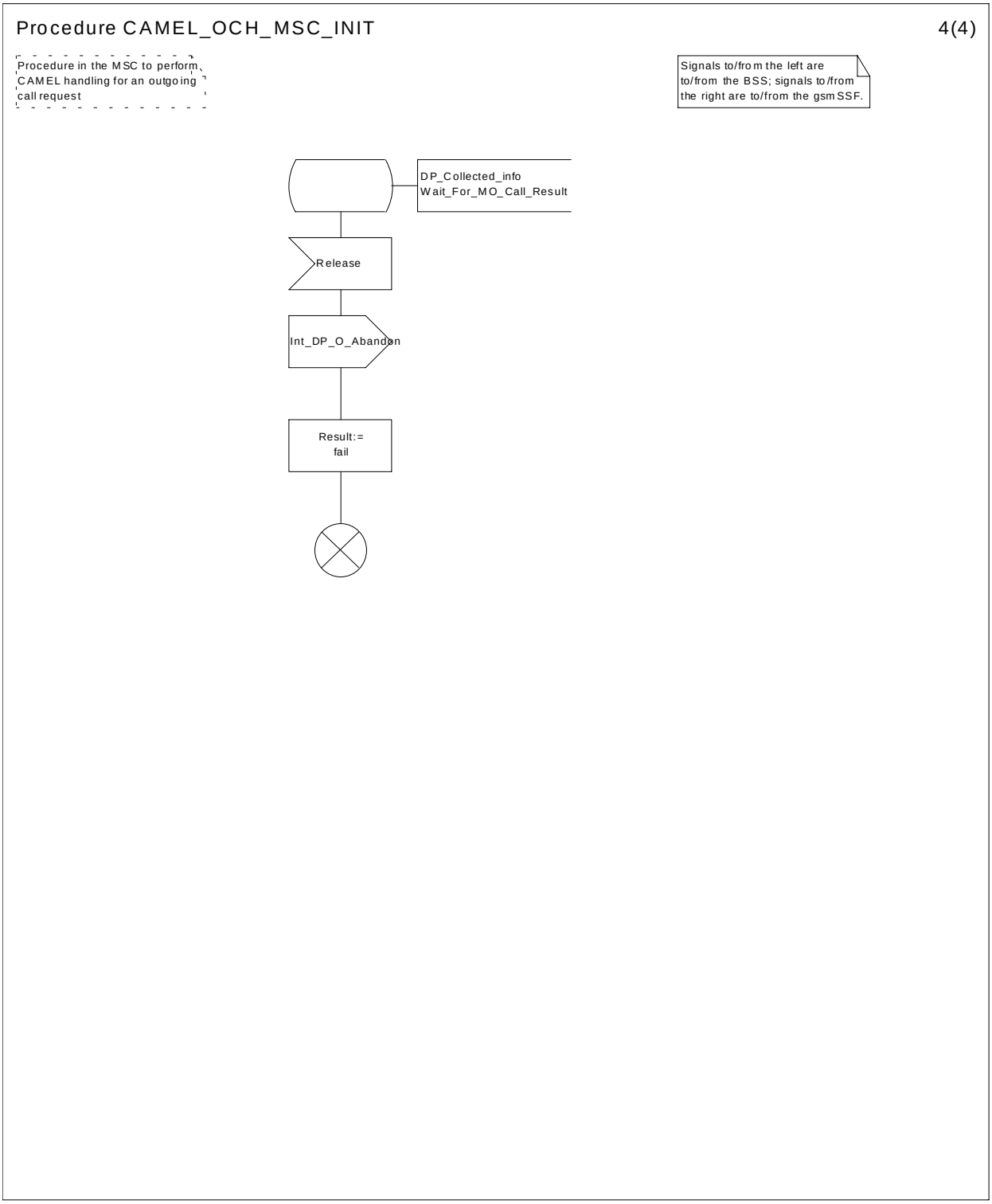

Figure 10d: Procedure CAMEL_OCH_MSC_INIT (sheet 4)

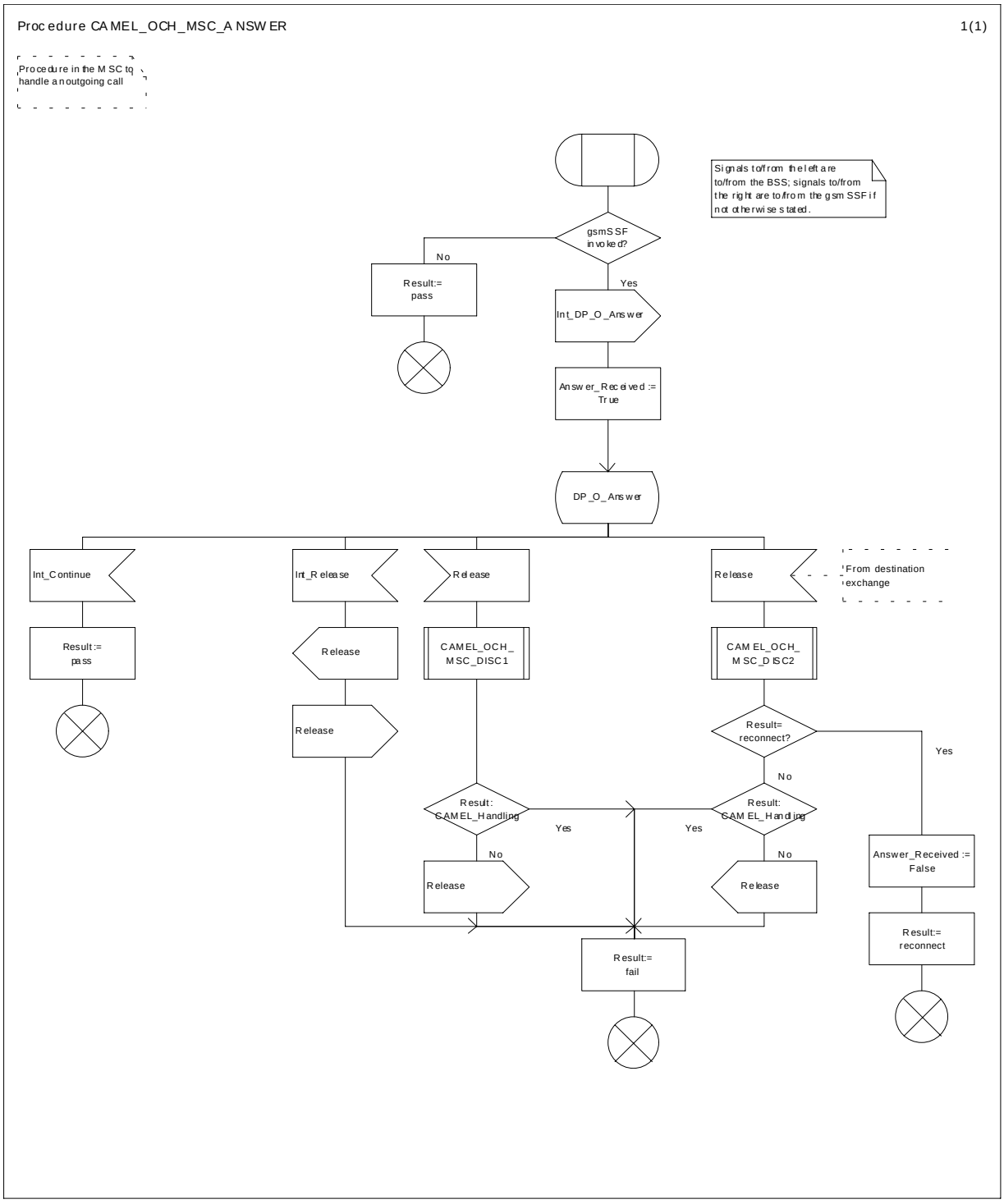

Figure 11a: Procedure CAMEL_OCH_MSC_ANSWER (sheet 1)

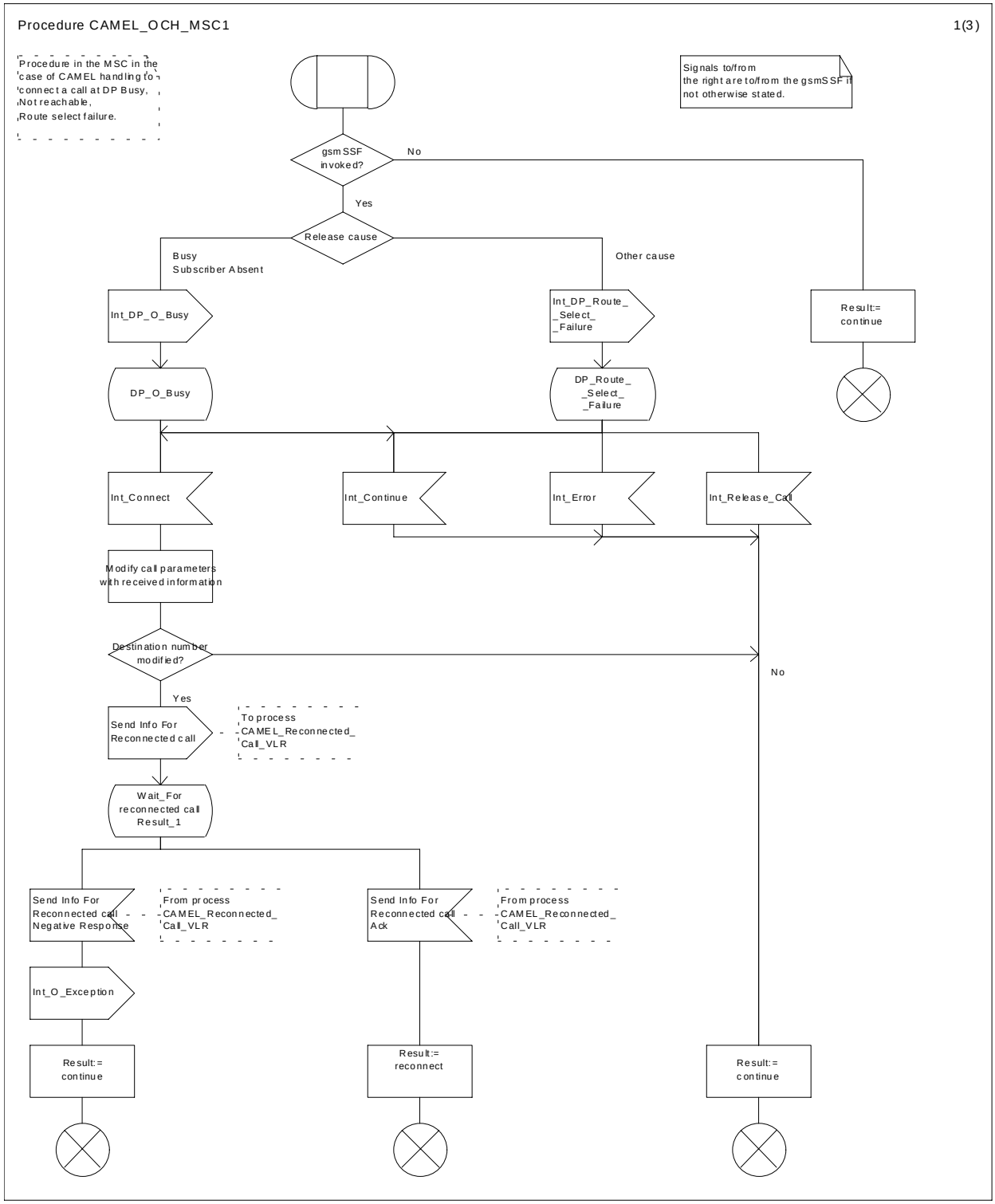

Figure 12a: Procedure CAMEL_OCH_MSC1 (sheet 1)

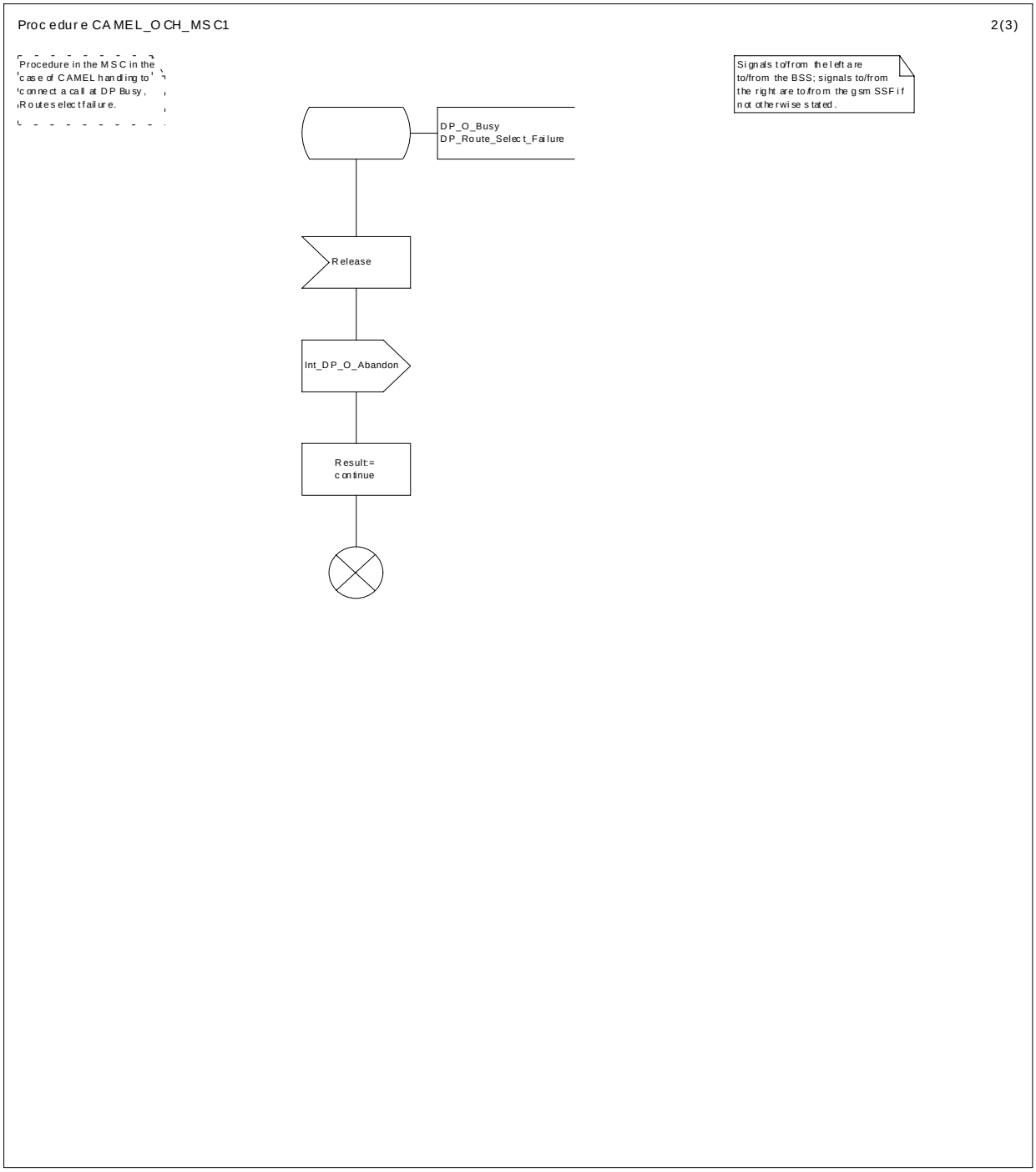

Figure 12b: Procedure CAMEL_OCH_MSC1 (sheet 2)

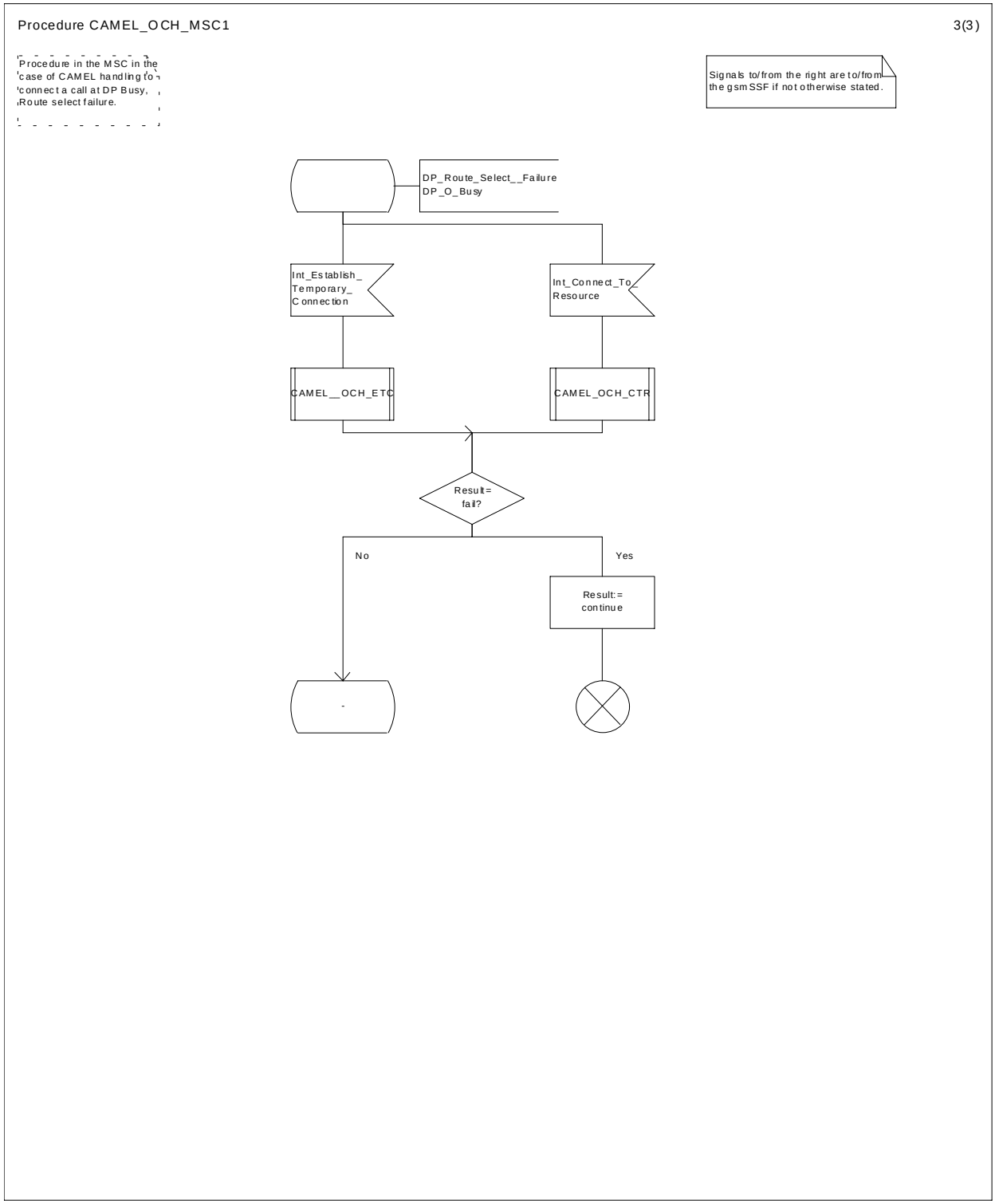

Figure 12c: Procedure CAMEL_OCH_MSC1 (sheet 3)

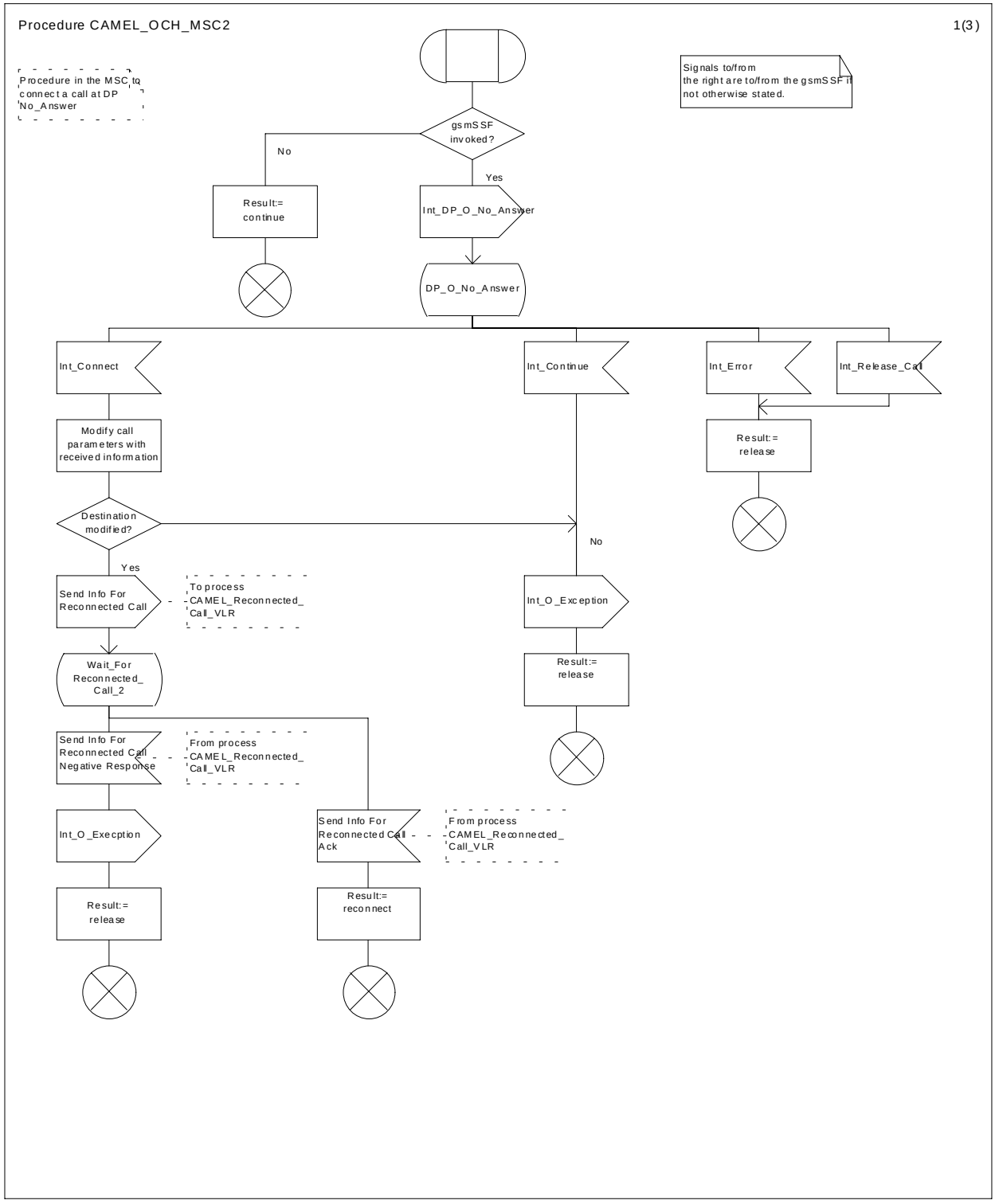

Figure 13a: Procedure CAMEL_OCH_MSC2 (sheet 1)

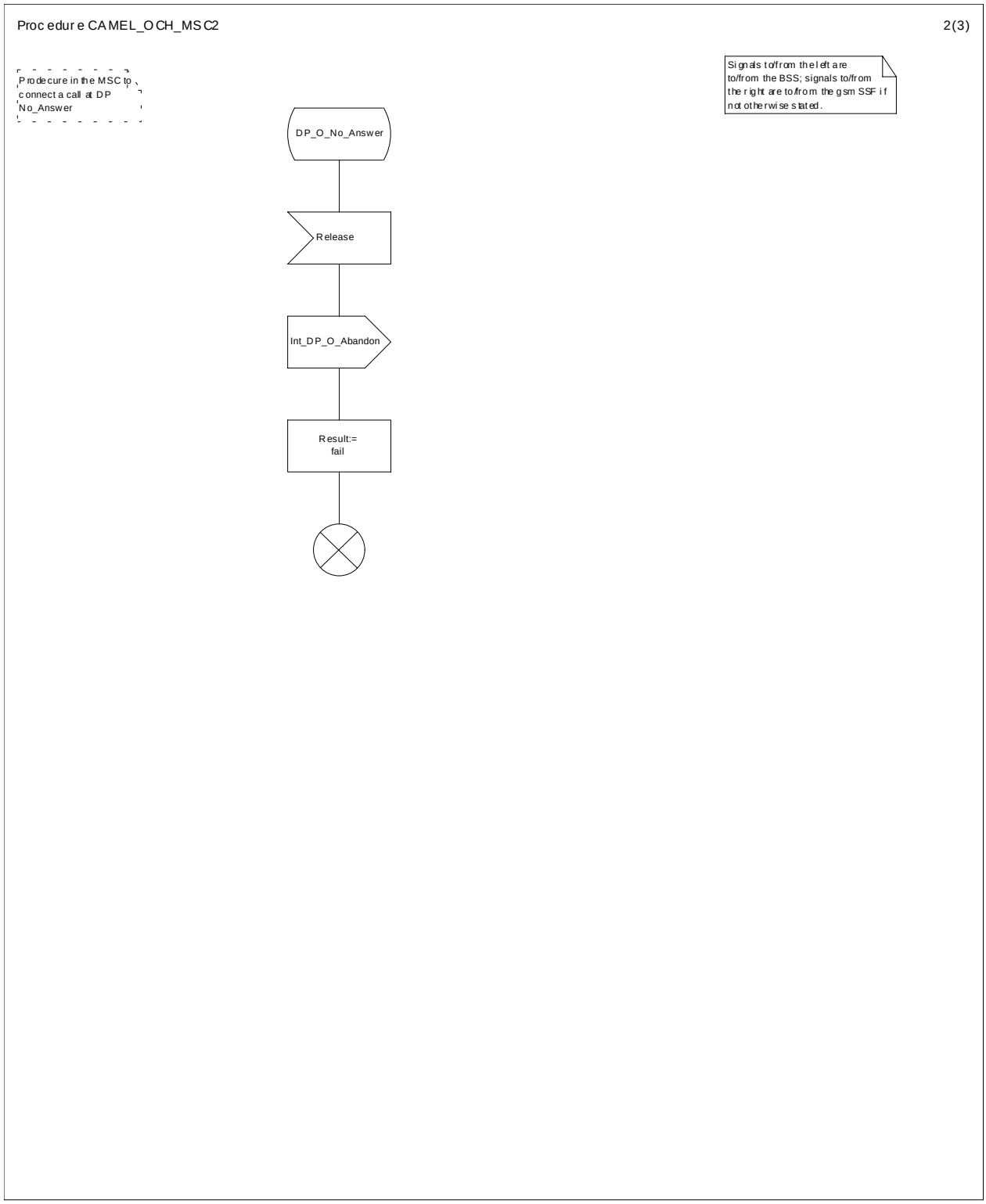

Figure 13b: Procedure CAMEL_OCH_MSC2 (sheet 2)

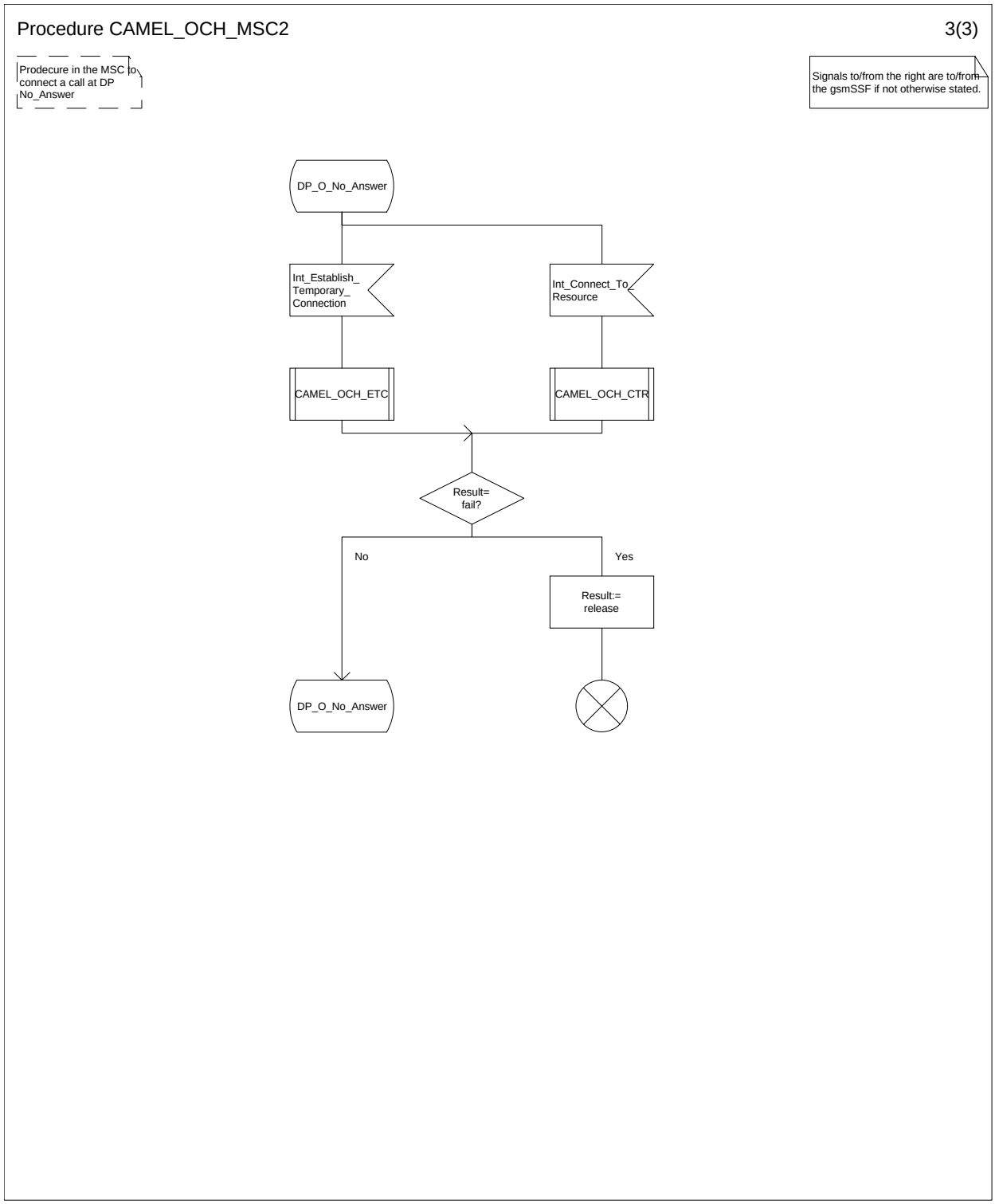

Figure 13c: Procedure CAMEL_OCH_MSC2 (sheet 3)

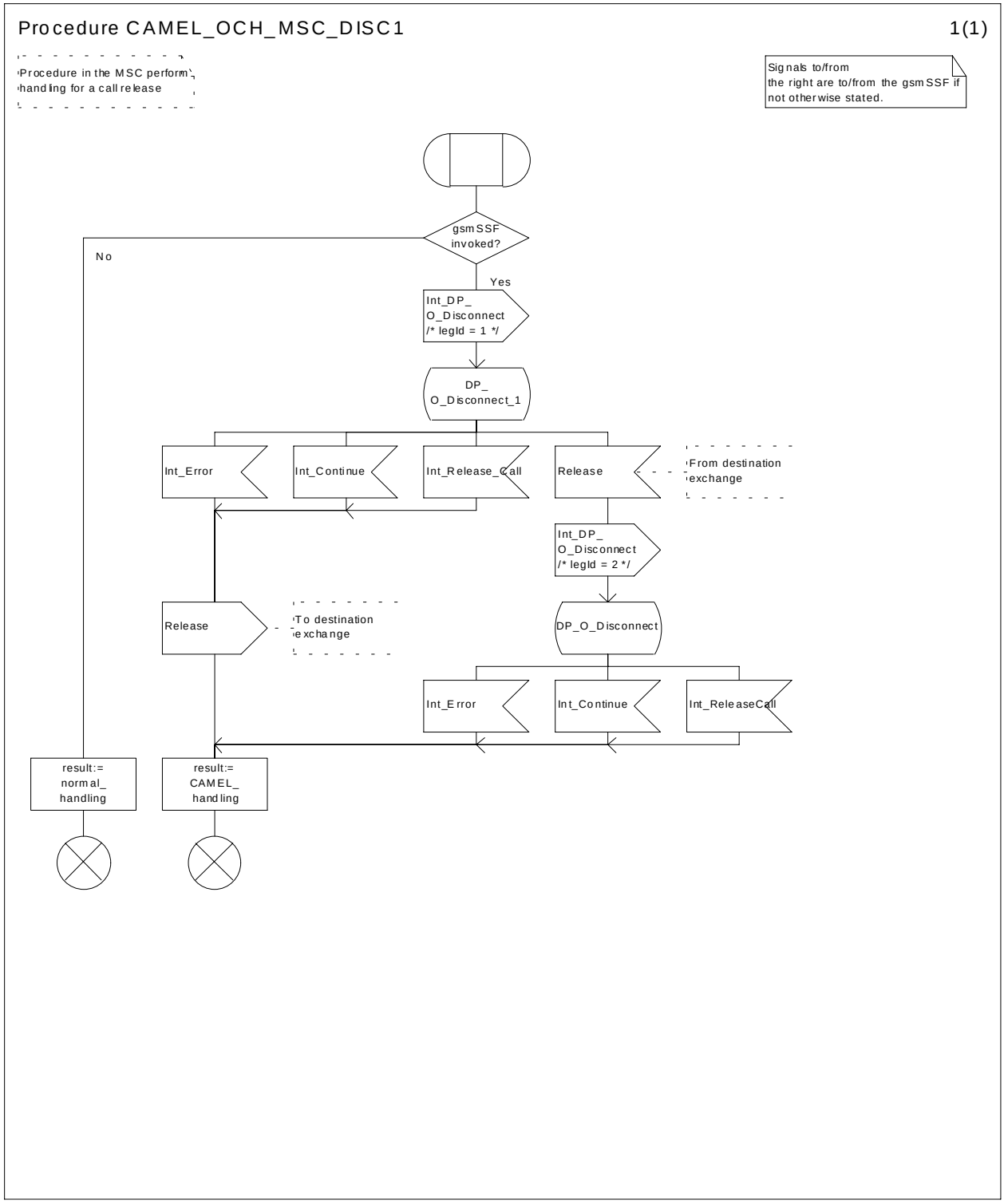

Figure 14a: Procedure CAMEL_OCH_MSC_DISC1 (sheet 1)

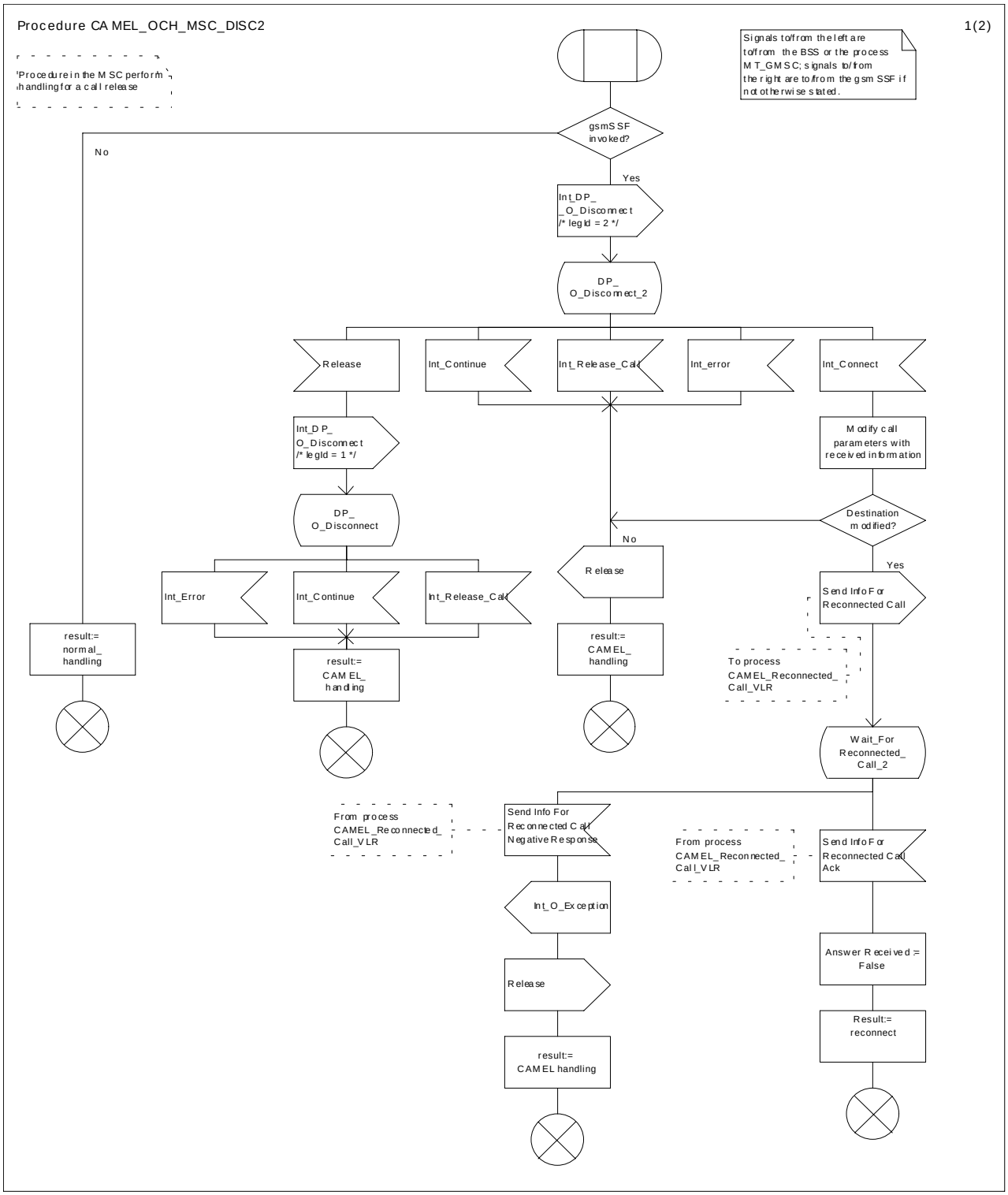

Figure 15a: Procedure CAMEL_OCH_MSC_DISC2 (sheet 1)

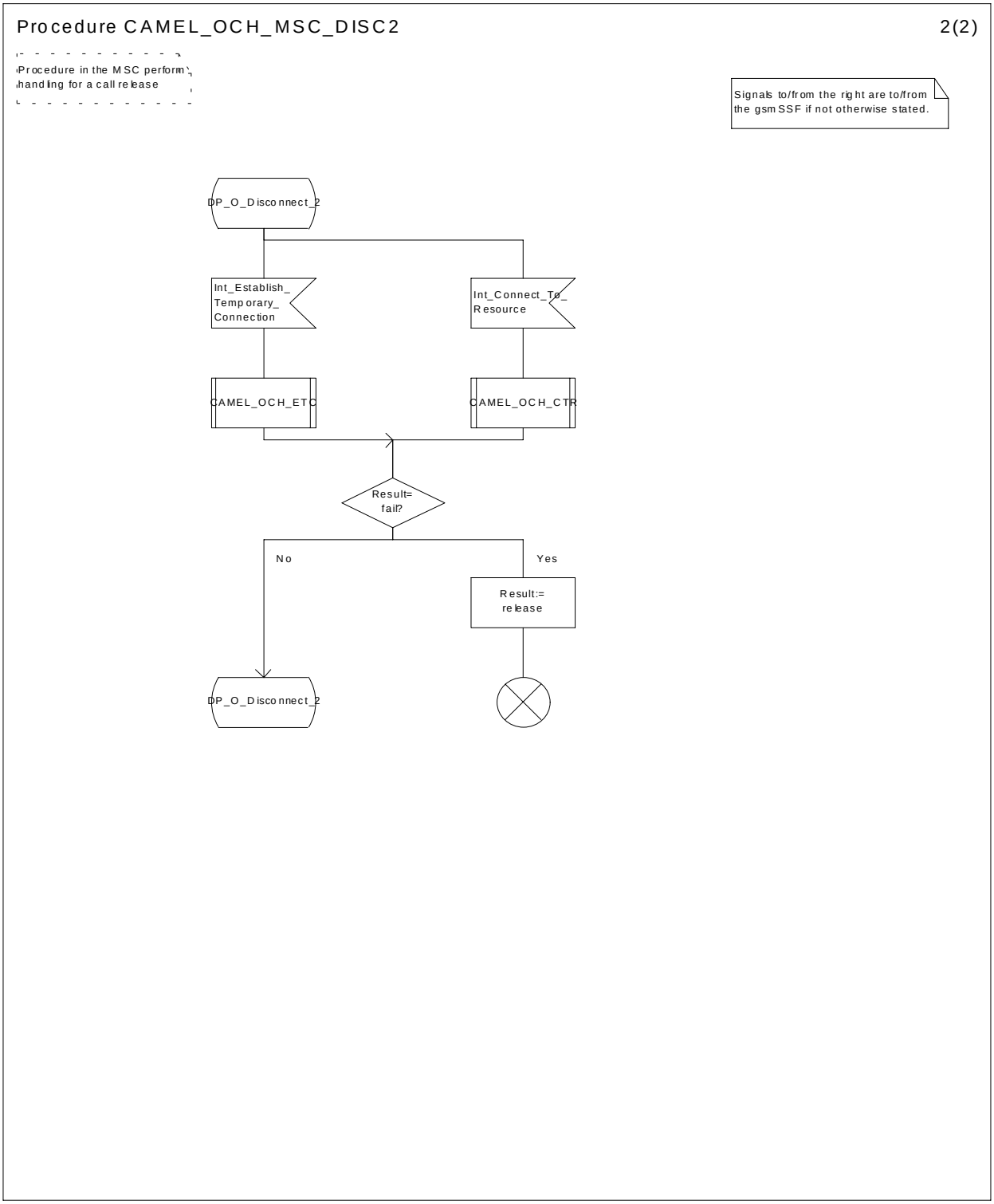

Figure 15b: Procedure CAMEL_OCH_MSC_DISC2 (sheet 2)

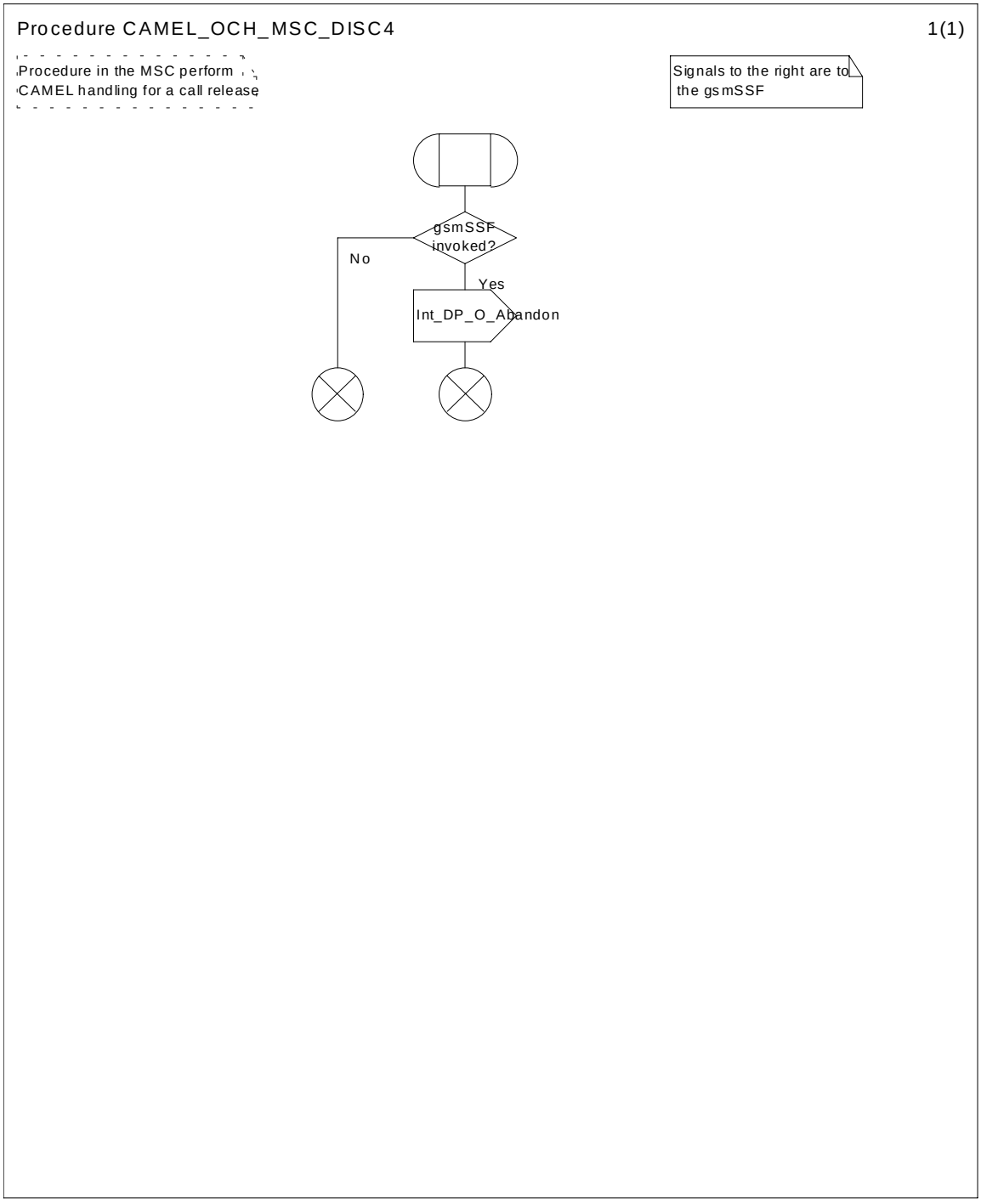

Figure 16a: Procedure CAMEL_OCH_MSC_DISC4 (sheet 1)

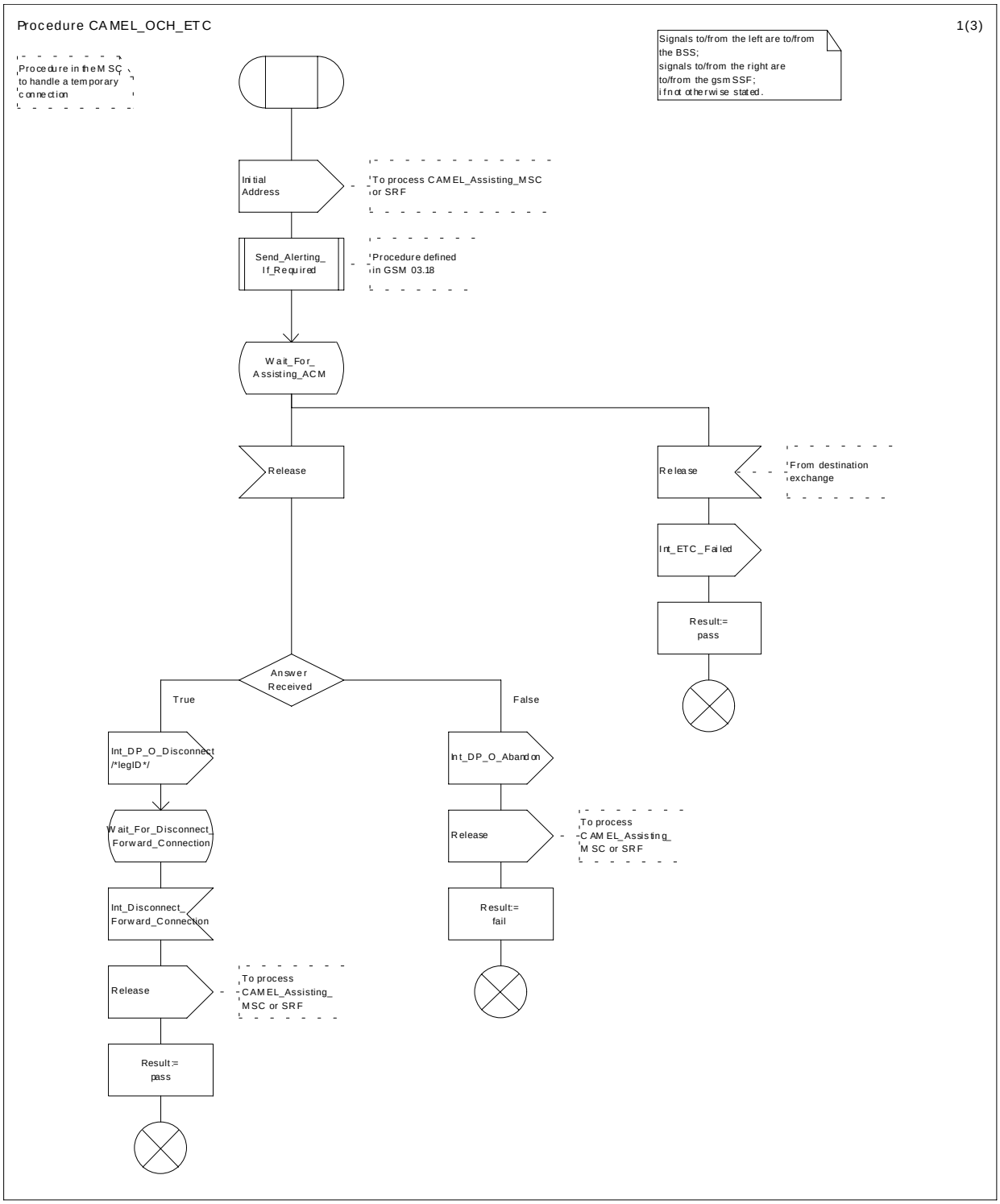

Figure 17a: Procedure CAMEL_OCH_ETC (sheet 1)

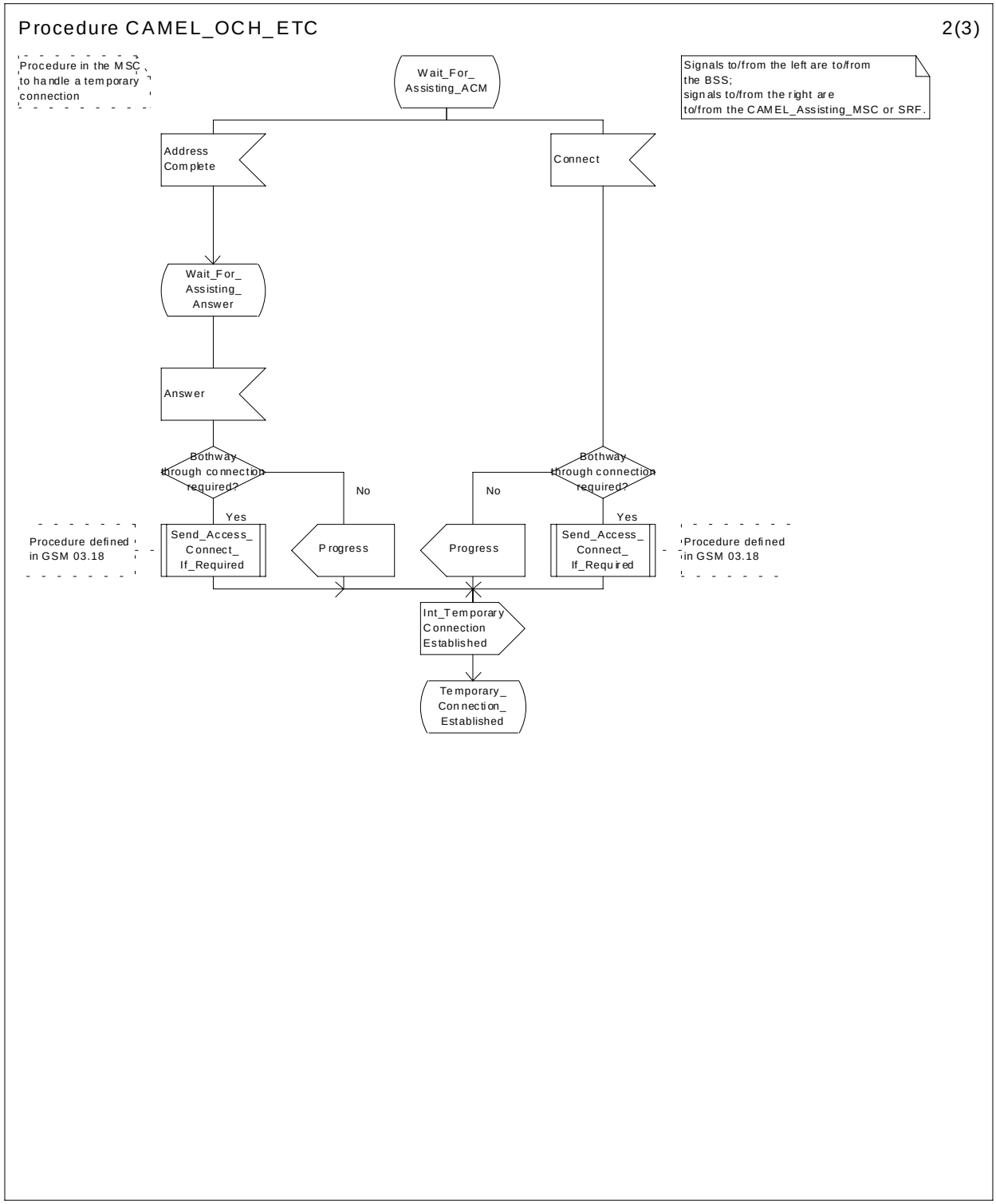

Figure 17b: Procedure CAMEL_OCH_ETC (sheet 2)

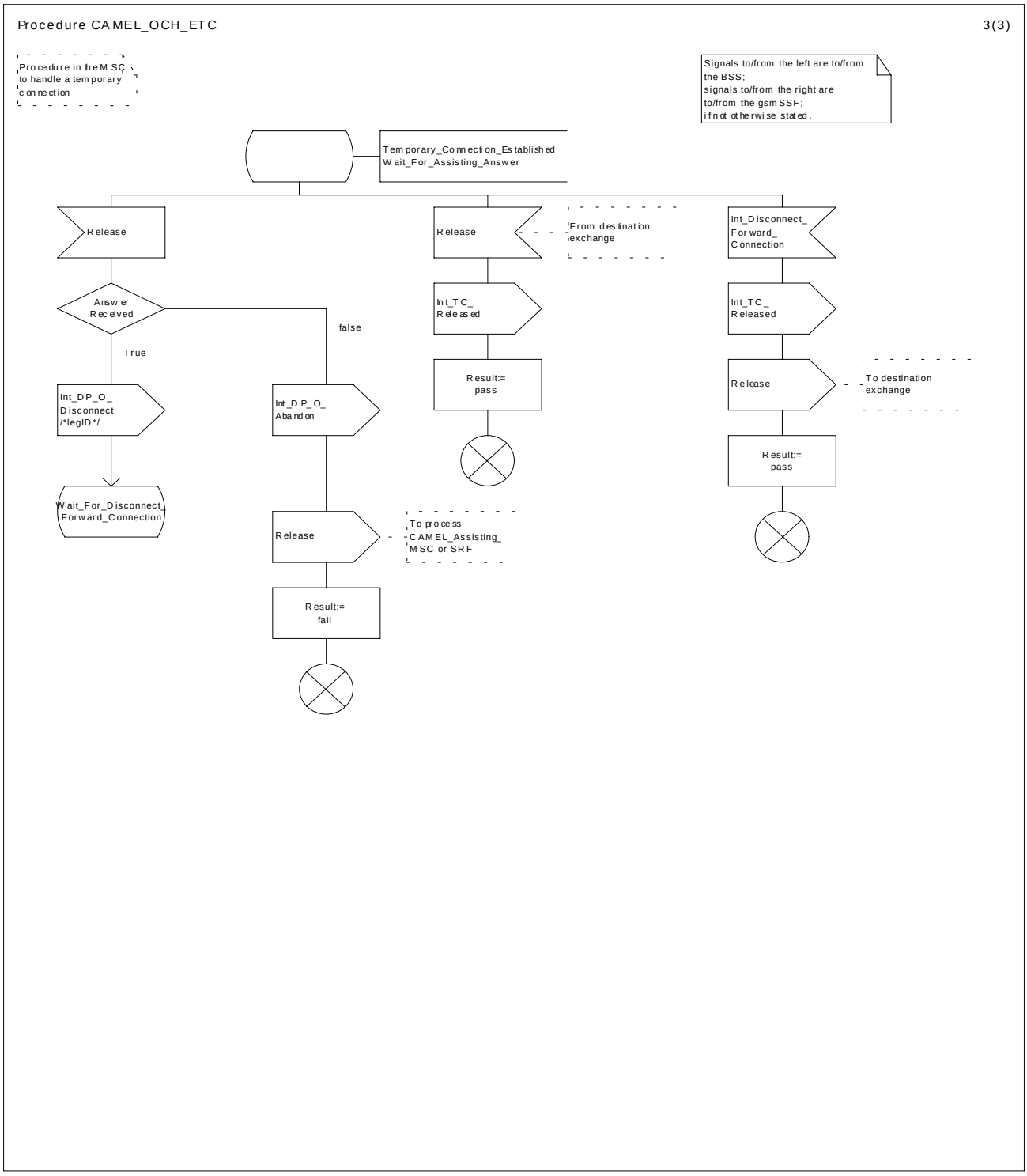

Figure 17c: Procedure CAMEL_OCH_ETC (sheet 3)

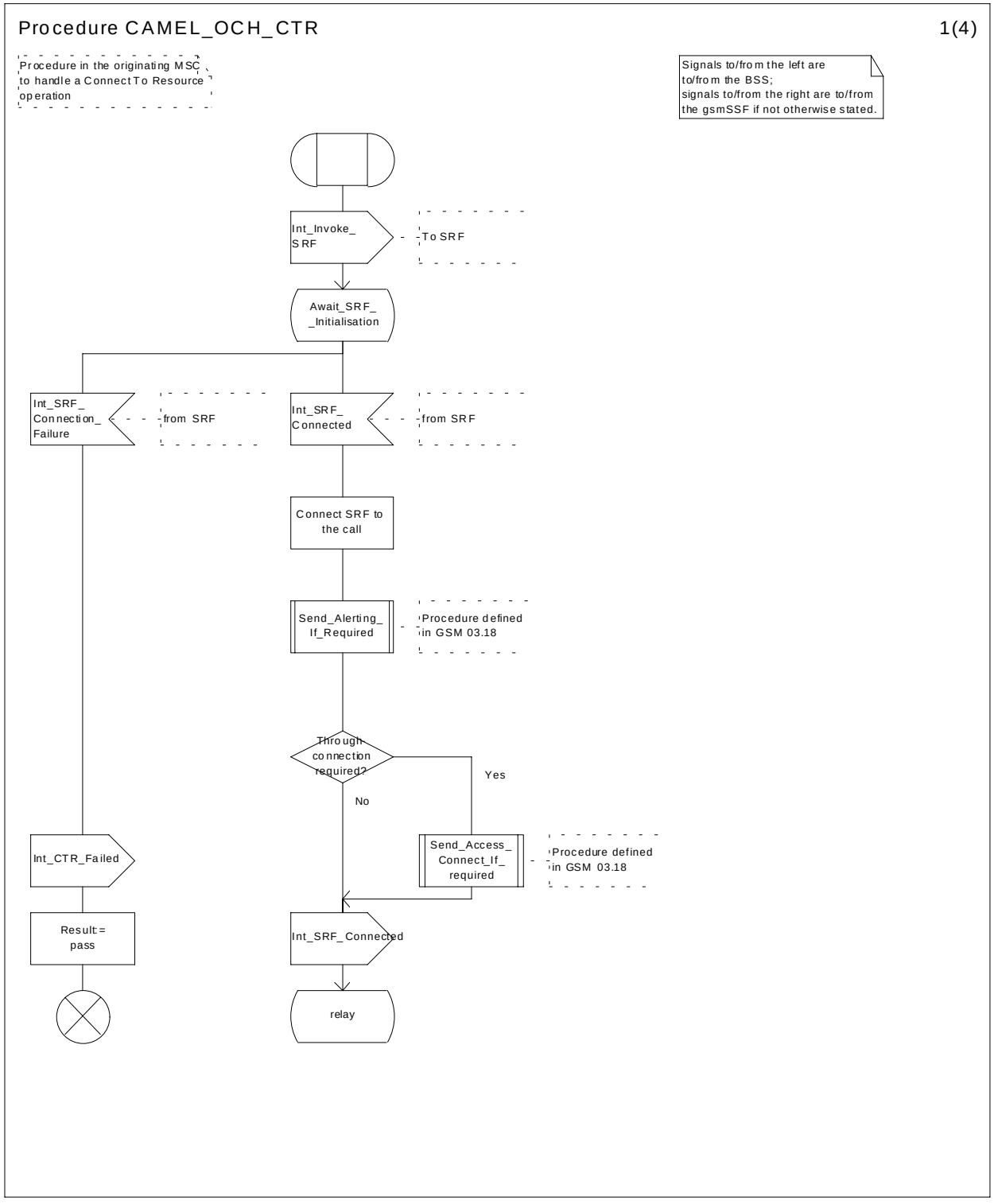

Figure 18a: Procedure CAMEL_OCH_CTR (sheet 1)

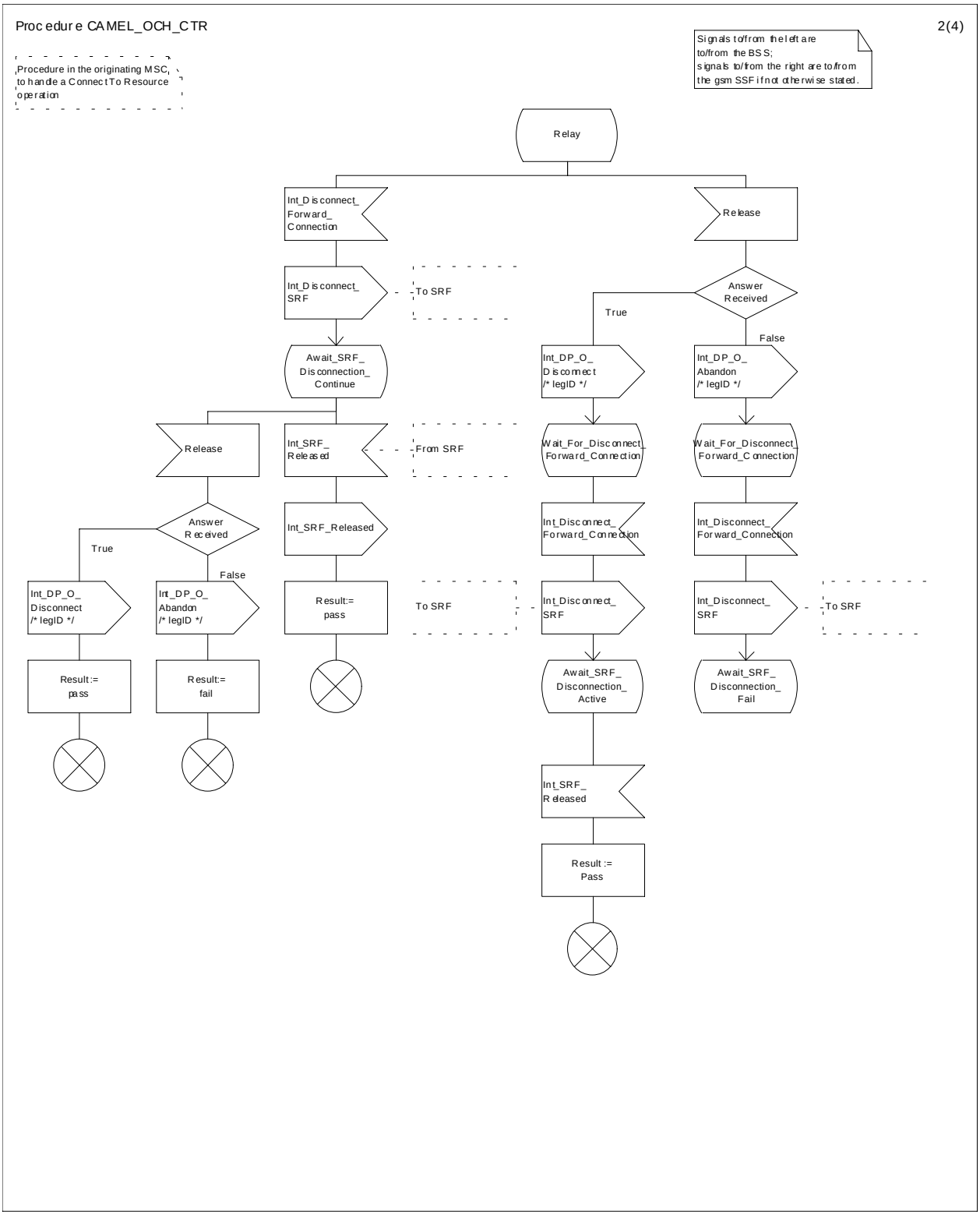

Figure 18b: Procedure CAMEL_OCH_CTR (sheet 2)

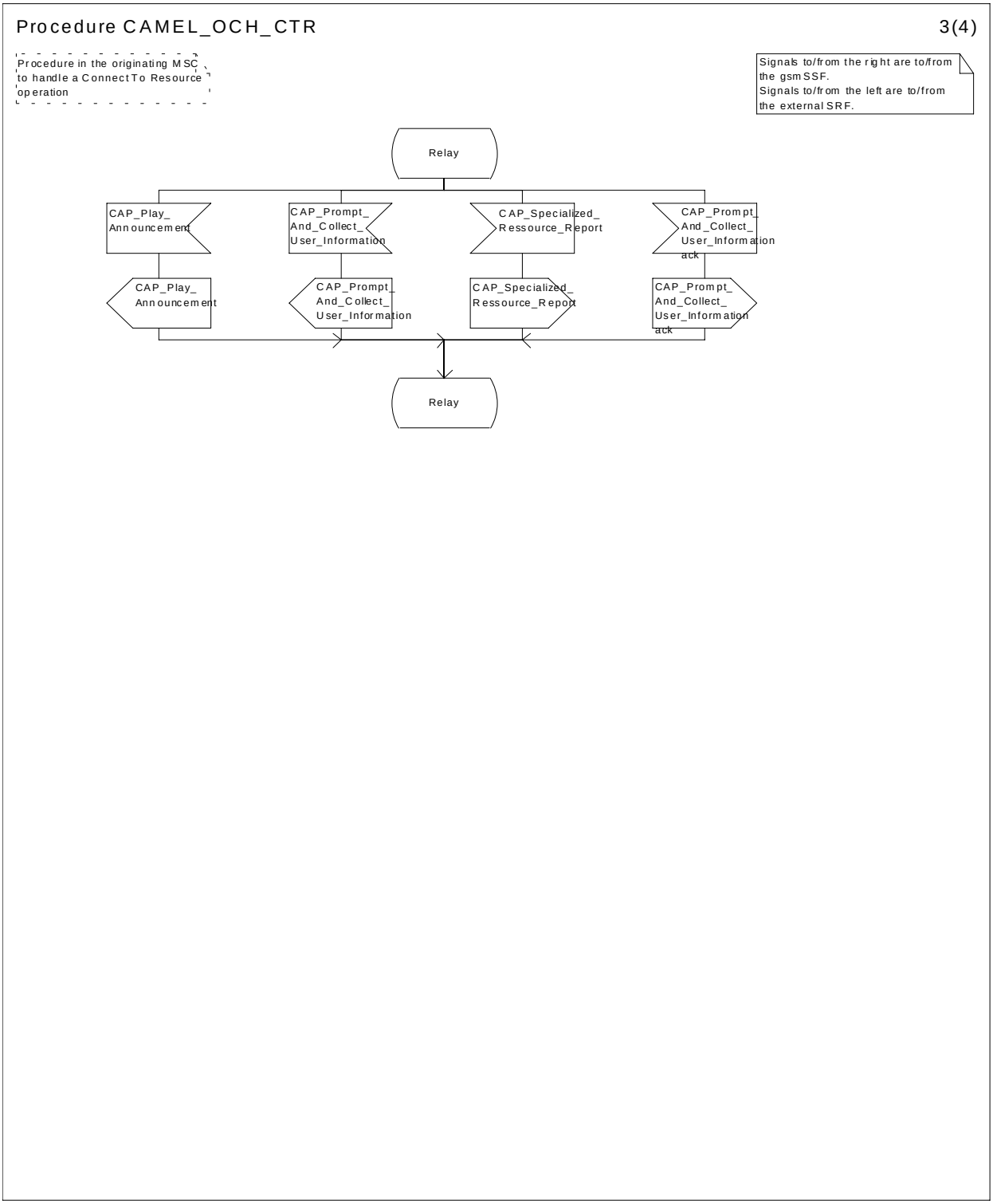

Figure 18c: Procedure CAMEL_OCH_CTR (sheet 3)

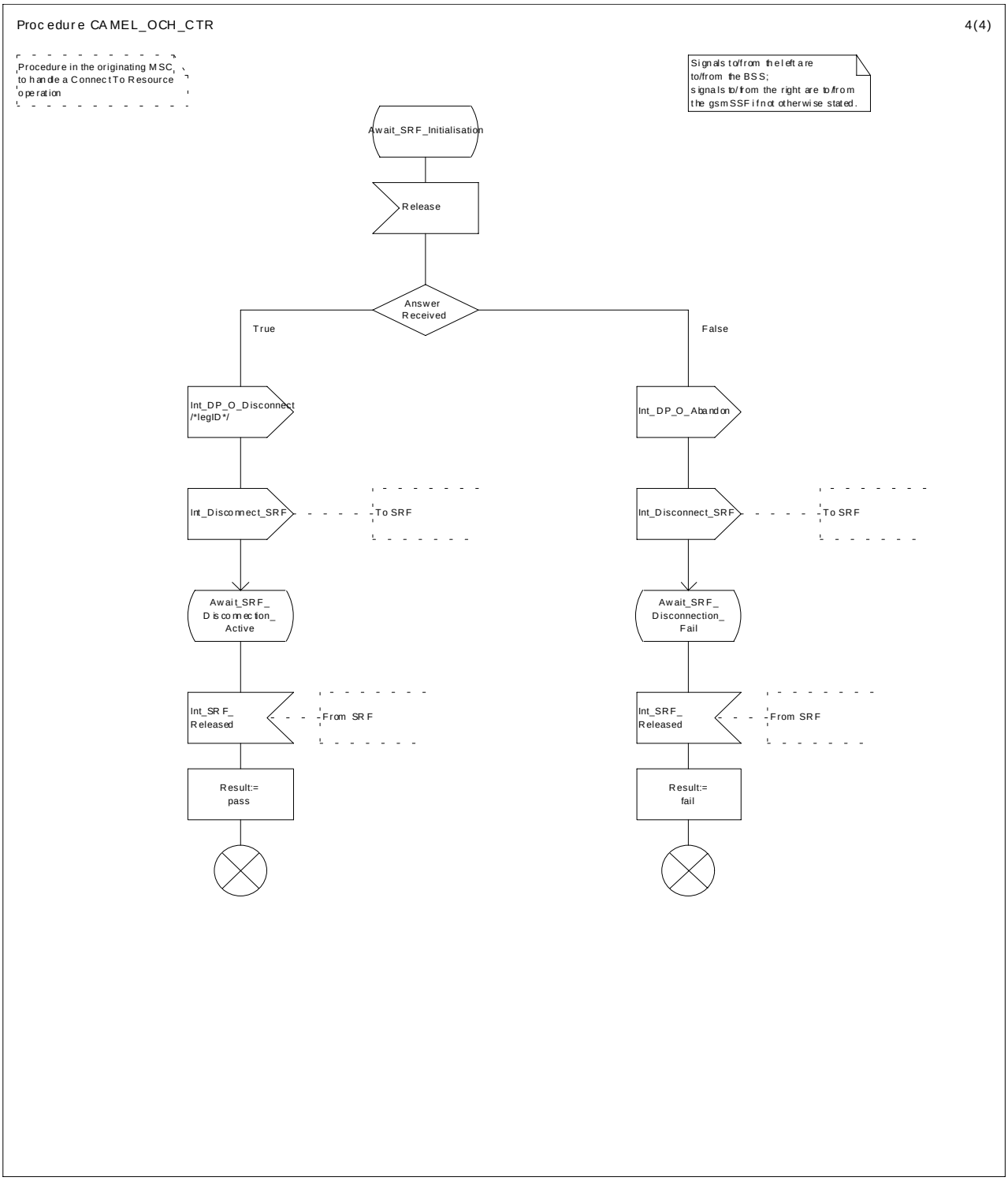

Figure 18d: Procedure CAMEL_OCH_CTR (sheet 4)

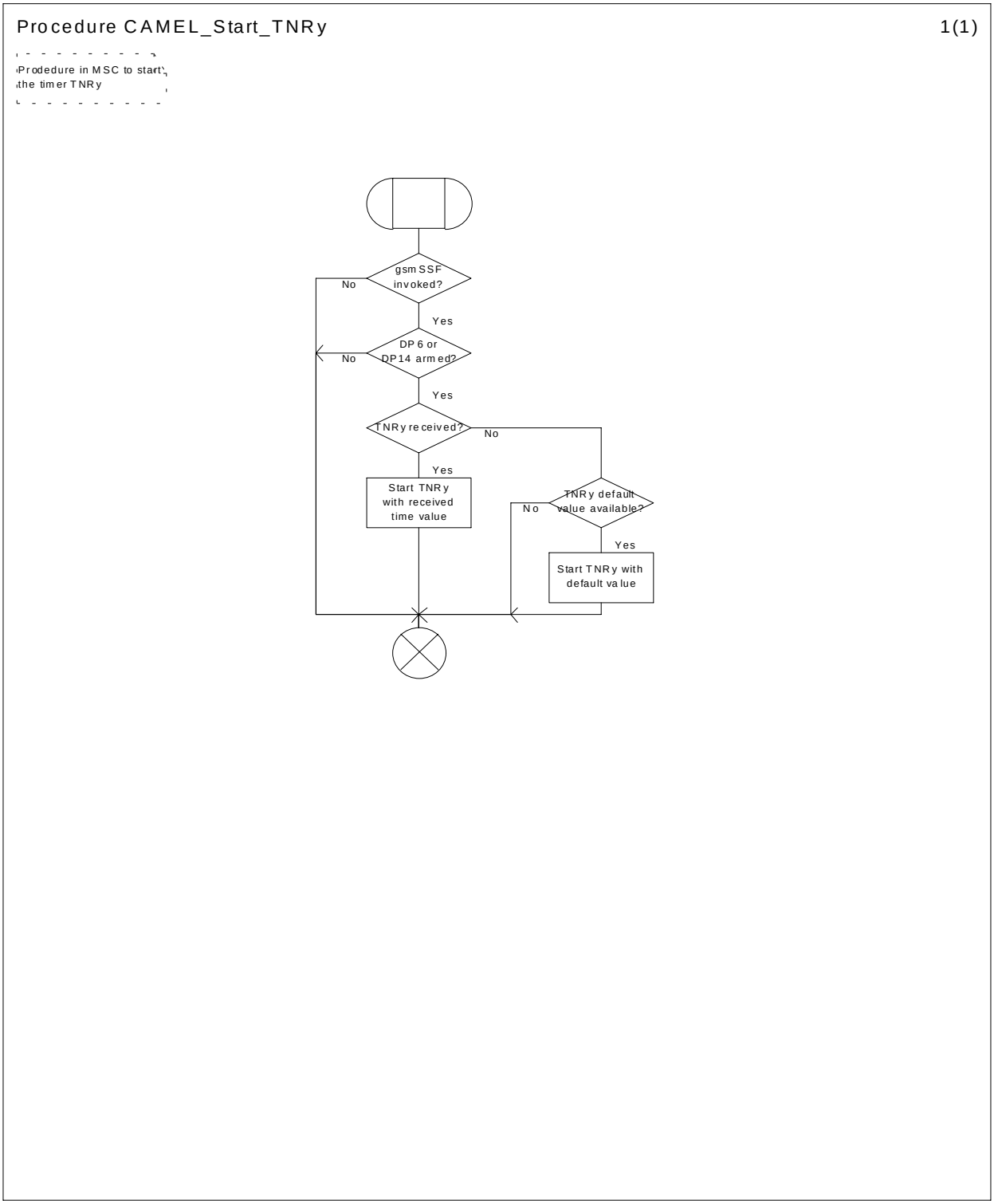

Figure 19a: Procedure CAMEL_Start_TNRy (sheet 1)

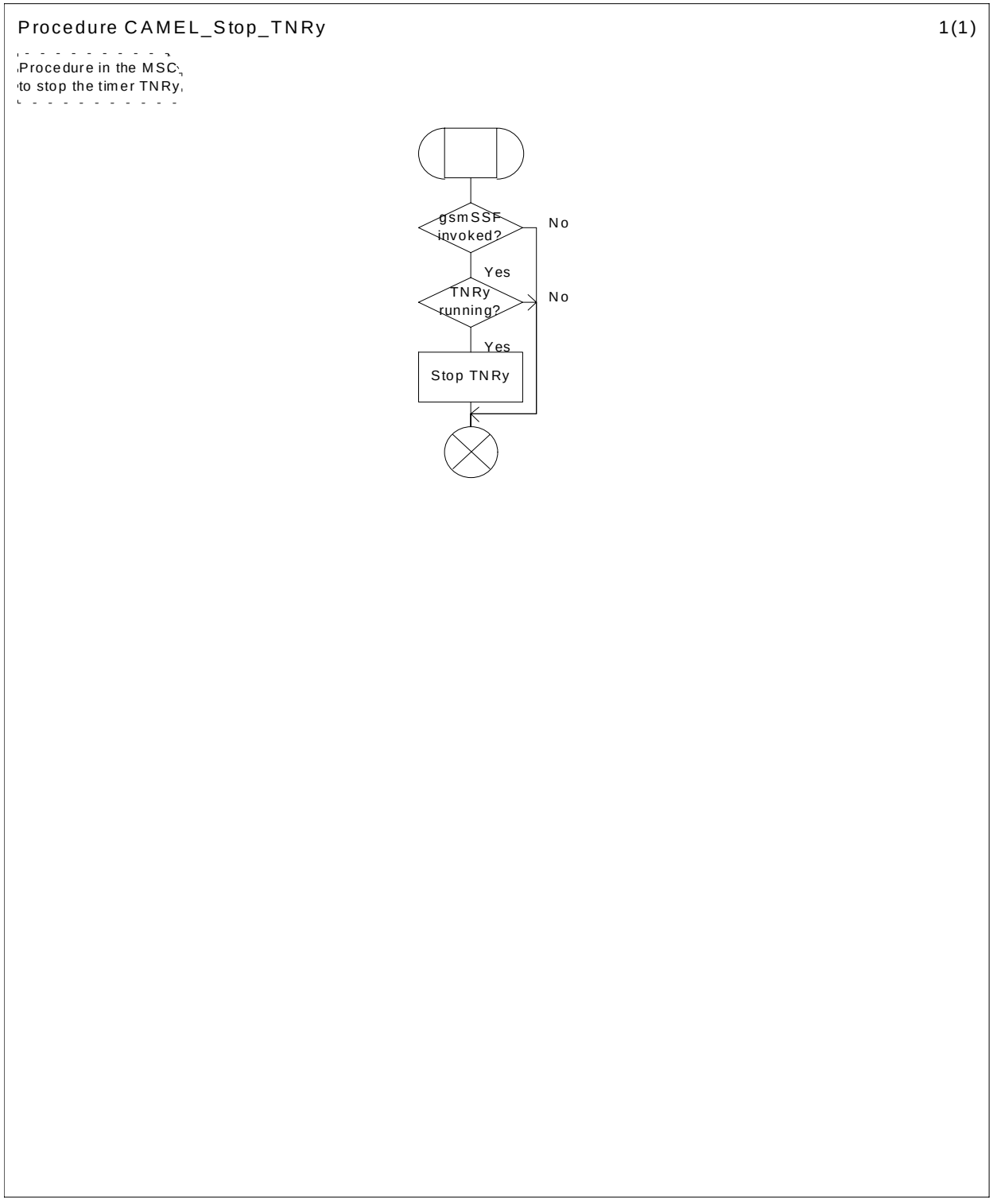

Figure 20a: Procedure CAMEL_Stop_TNRy (sheet 1)

8.2.2 Handling of mobile originating calls in the originating VLR

The functional behaviour of the originating VLR is specified in 3GPP TS03.18 [3]. The procedure specific to CAMEL are specified in this subclause :

- Procedure CAMEL_OCH_VLR;
- Process CAMEL_Reconnected_Call_VLR.

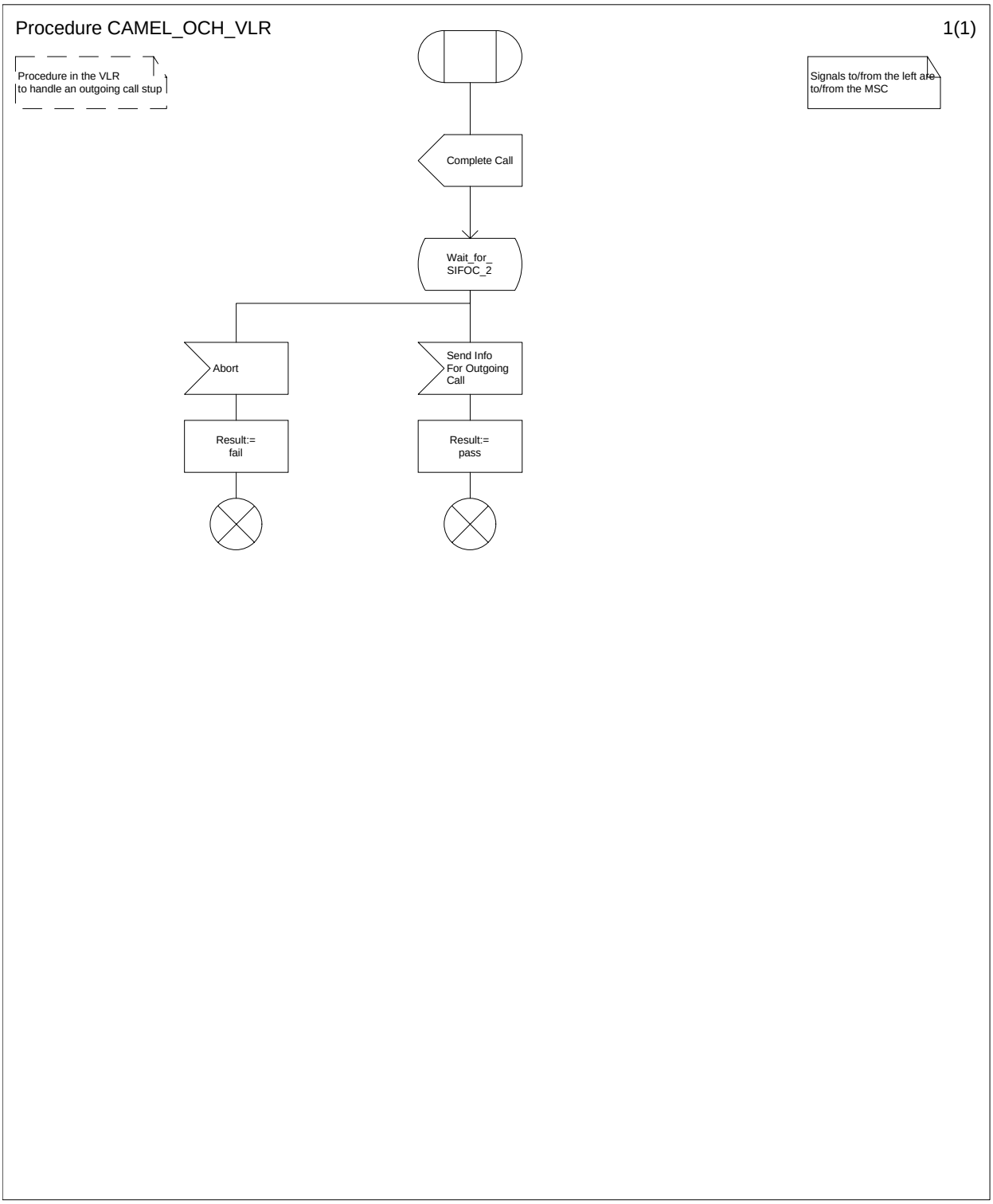

Figure 21a: Procedure CAMEL_OCH_VLR (sheet 1)

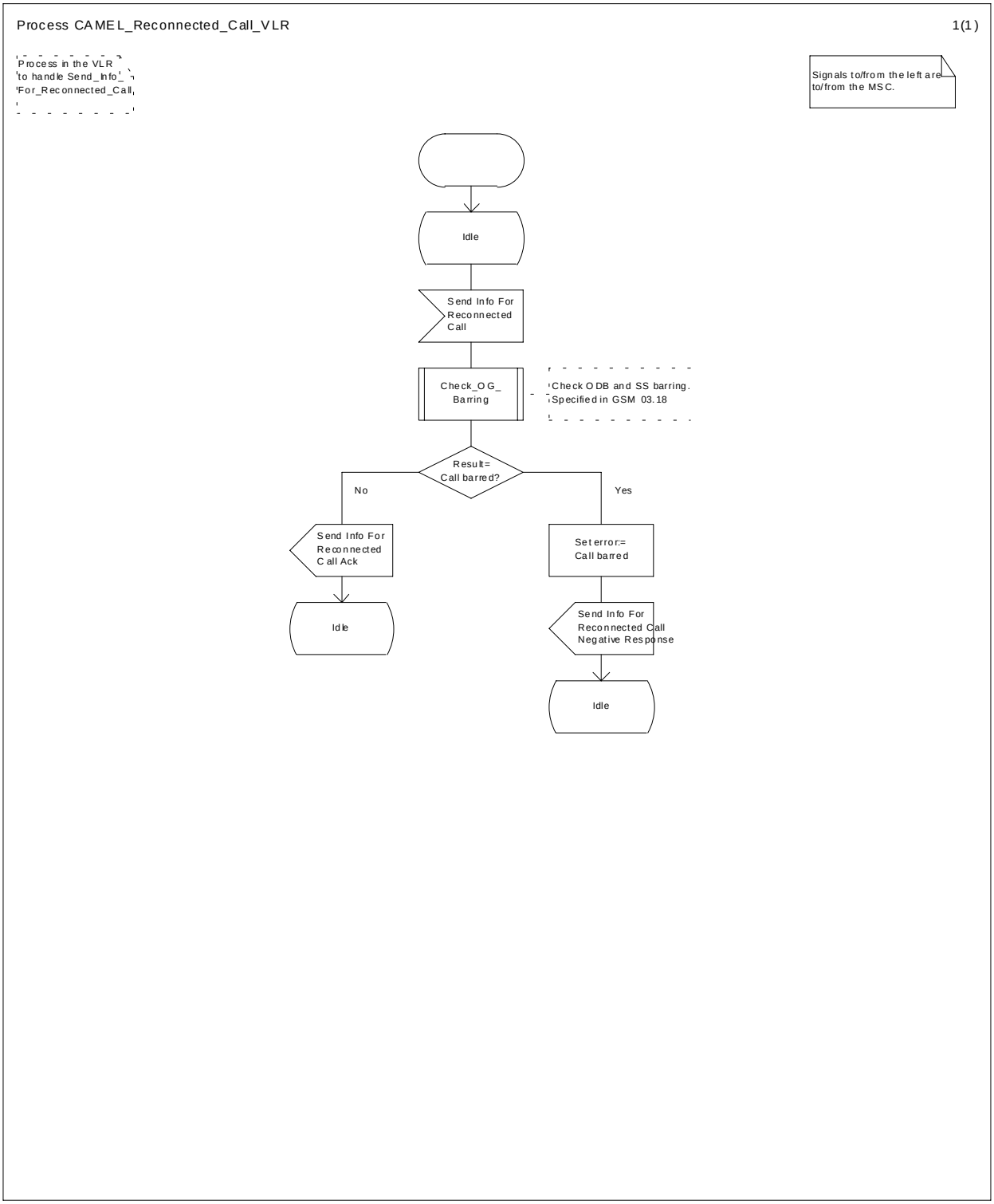

Figure 22a: Process CAMEL_Reconnected_Call_VLR (sheet 1)

8.3 Retrieval of routeing information

8.3.1 Retrieval of routeing information in the GMSC

The functional behaviour of the GMSC is specified in 3GPP TS03.18 [3]. The procedures specific to CAMEL are specified in this subclause:

- Procedure CAMEL_Set_ORA_Parameters;
- Procedure CAMEL_MT_GMSC_INIT;
- Procedure CAMEL_MT_GMSC_ANSWER;
- Procedure CAMEL_MT_GMSC_DISC1;
- Procedure CAMEL_MT_GMSC_DISC2;
- Procedure CAMEL_MT_GMSC_DISC4;
- Procedure CAMEL_MT_GMSC_DISC5;
- Procedure CAMEL_MT_GMSC_DISC6;
- Procedure CAMEL_MT_CTR;
- Procedure CAMEL_MT_ETC;
- Procedure CAMEL_Start_TNRy;
- Procedure CAMEL_Stop_TNRy;
- Procedure CAMEL_MT_GMSC_Notify_CF.

The procedure Send_ACM_If_Required is specified in 3GPP TS03.18 [3].

The following paragraphs gives details on the behaviour of the GMSC in the procedure CAMEL_MT_GMSC_INIT.

8.3.1.1 Action of the GMSC on receipt of Int_Release_Call

An ISUP_Release is sent to the originating exchange and resources are released.

8.3.1.2 Action of the GMSC on receipt of Int_Error

The GMSC checks in T-CSI the default Call Handling parameter.

If the default call handling is release call, an ISUP_Release is sent to the originating exchange. The MSC then releases all call resources and the procedure CAMEL_MT_GMSC_INIT returns result=fail.

If the default call handling is continue call, the MSC continue call handling without CAMEL support.

8.3.1.3 Action of the GMSC on receipt of Int_Continue

If a FTN has been stored the information received from HLR is used to overwrite corresponding call parameters. Note that the MSISDN is replaced by the FTN as the Called party number. The redirection counter is incremented.

If no FTN has been stored, a Send Routeing Info message including a T-CSI suppression parameter is sent to the HLR. The Send Routing Info includes an indication which phase of CAMEL is supported by the GMSC/gsmSSF.

8.3.1.4 Action of the GMSC on receipt of Int_Connect

If the Destination Number received from the gsmSCF (via the gsmSSF) is the same as the ISUP Called party number, i.e. the MSISDN, the following parameters, if received, are used to overwrite the corresponding ISUP parameters (for mapping see 3GPP TS09.78 [5]): Calling Partys Category and Generic Number. If received, the Announcement Suppression Indicator is stored. The further processing is described in subclause 8.3.1.3 with the addition that the Announcement Suppression indicator, if stored, is sent to the HLR in the Send_Routeing_Info message.

If:

- the Destination Number received from the gsmSCF (via the gsmSSF) is not the same as the stored ISUP Called party number, i.e. the MSISDN; and
- a CUG active indication was received from the HLR ; and
- CUG information was received in the ISUP_IAM for the incoming call,

then an exception event is reported to the process gsmSSF, an ISUP_Release is sent to the originating exchange and all resources are released.

Otherwise the following parameters, if received, are used to overwrite the corresponding ISUP parameters (for mapping see 3GPP TS09.78 [5]): Destination Number, Calling Partys Category, Generic Number, Original Called Party ID, Redirecting Party ID and Redirection Information. Call parameters that are not included in the Int_Connect message are unchanged.

As a network operator option loop prevention mechanisms may cause the redirection information to be ignored or modified (e.g., if the Redirection counter has been decreased).

Signalling limitations or regulatory requirements may require the Calling Partys Category, Generic Number, Original Called Party Number and Redirecting Party ID to be ignored or modified.

The network signalling system shall indicate that this is an internal network number.

8.3.1.5 Action of the GMSC on receipt of Send_Routeing_Info Negative Response (at state Wait_For_Routeing_Info_2)

An exception event is reported to the process gsmSSF. If the Announcement Suppression indicator has been received from the gsmSCF (via the gsmSSF) any announcements or tones shall be suppressed.

8.3.1.6 Action of the GMSC on receipt of Send_Routeing_Info ack with MSRN (at state Wait_For_Routeing_Info_2)

An ISUP_IAM with the MSRN as Called party number is constructed.

8.3.1.7 Action of the GMSC on receipt of Send_Routeing_Info ack with FTN (at state Wait_For_Routeing_Info_2)

The information received from HLR is used to overwrite corresponding call parameters (for details see 3GPP TS03.18 [3]). The redirection counter is incremented.

8.3.1.8 Action of the GMSC on receipt of Send_Routeing_Info ack with O-CSI and FTN (at state Wait_For_Routeing_Info_2)

The information received from the HLR is used to overwrite corresponding call parameters. The redirection counter is incremented. The Called Party Number is set to FTN.

8.3.1.9 Action of the GMSC in procedure CAMEL_MT_ETC

In procedure CAMEL_MT_ETC (sheet 2) the GMSC will remain in the Wait_For_Assiting_Answer state until it receives an ISUP Answer Message (ANM) or timeout occurs. This is to ensure that a call record is always generated for every successful establishment of a temporary connection to a gsmSRF, especially in the case where the connection is between PLMNs.

NOTE: This means that it may not be possible to access an SRF which does not generate an ISUP Answer Message (ANM).

If a Progress message is sent towards the MS the progress indicator shall indicate "In Band Information".

8.3.1.10 Action of the GMSC in procedure CAMEL_MT_GMSC_Notify_CF

The Forwarding reason is taken from the Send Routeing Info ack (for early call forwarding) or the Resume Call Handling (for Optimal Routeing of Late Call Forwarding).

The Int_DP_T_No_Answer and Int_DP_T_Busy messages include a parameter to indicate that the call has encountered conditional call forwarding. The gsmSSF will transfer this parameter to the CAP_Event_Report_BCSM message which it sends to the gsmSCF.

Note: The GMSC may receive a CF Conditional in the first Send Routeing Information ack. This CF may lead to a notification to the gsmSCF, depending on the presence of T-CSI in this first Send Routeing Information ack and on the dynamic arming of the T-Busy EDP by the gsmSCF.
Some GMSCs may not send the notification to the gsmSCF in above described scenario. In this case, the procedure continues the call processing.
As the rationale of the Notification of Call Forwarding principle is to inform the gsmSCF of notification after the second Send Routeing Information ack, the behaviour of these GMSC is not erroneous.

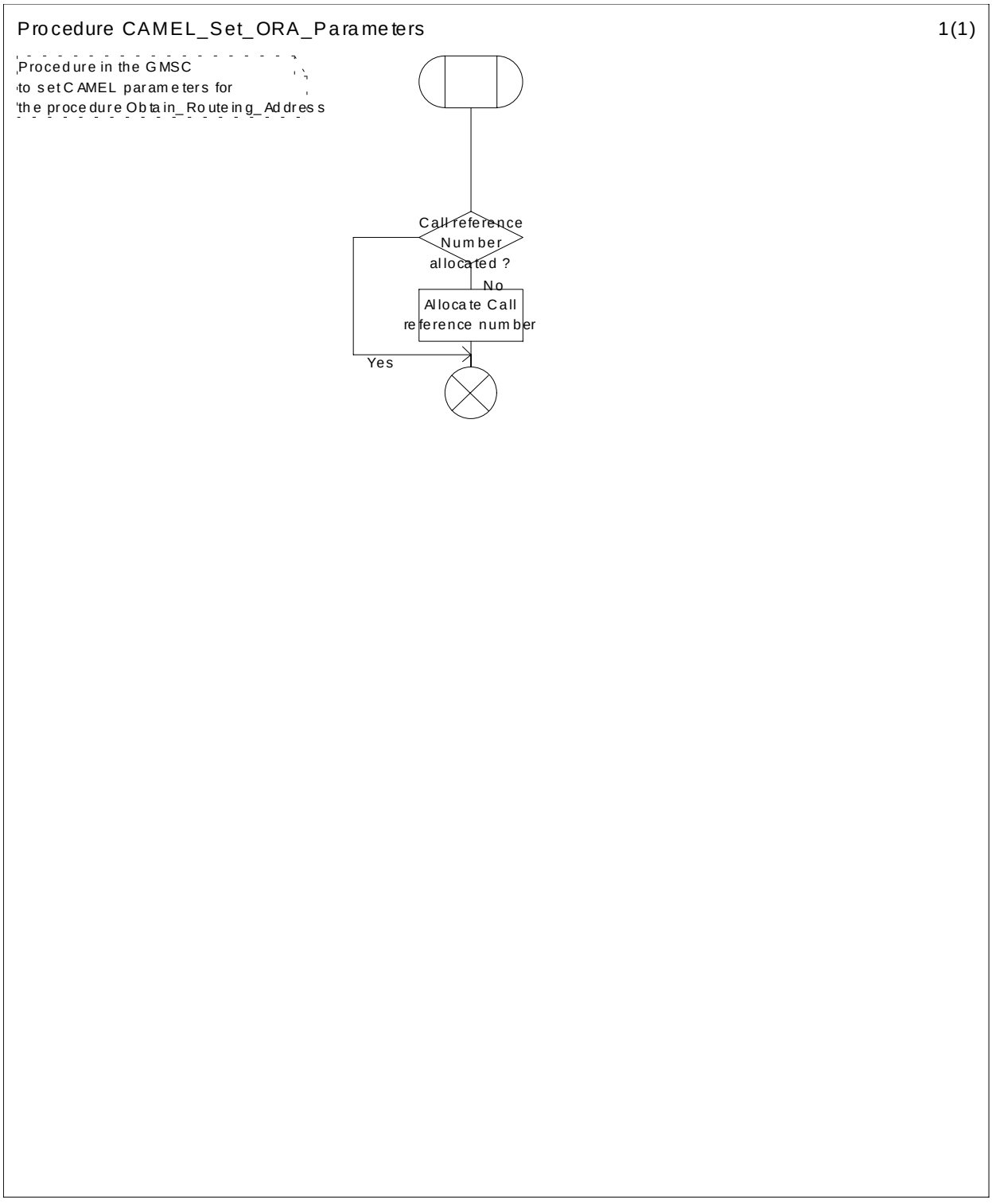

Figure 23a: Procedure CAMEL_Set_ORA_Parameters (sheet 1)

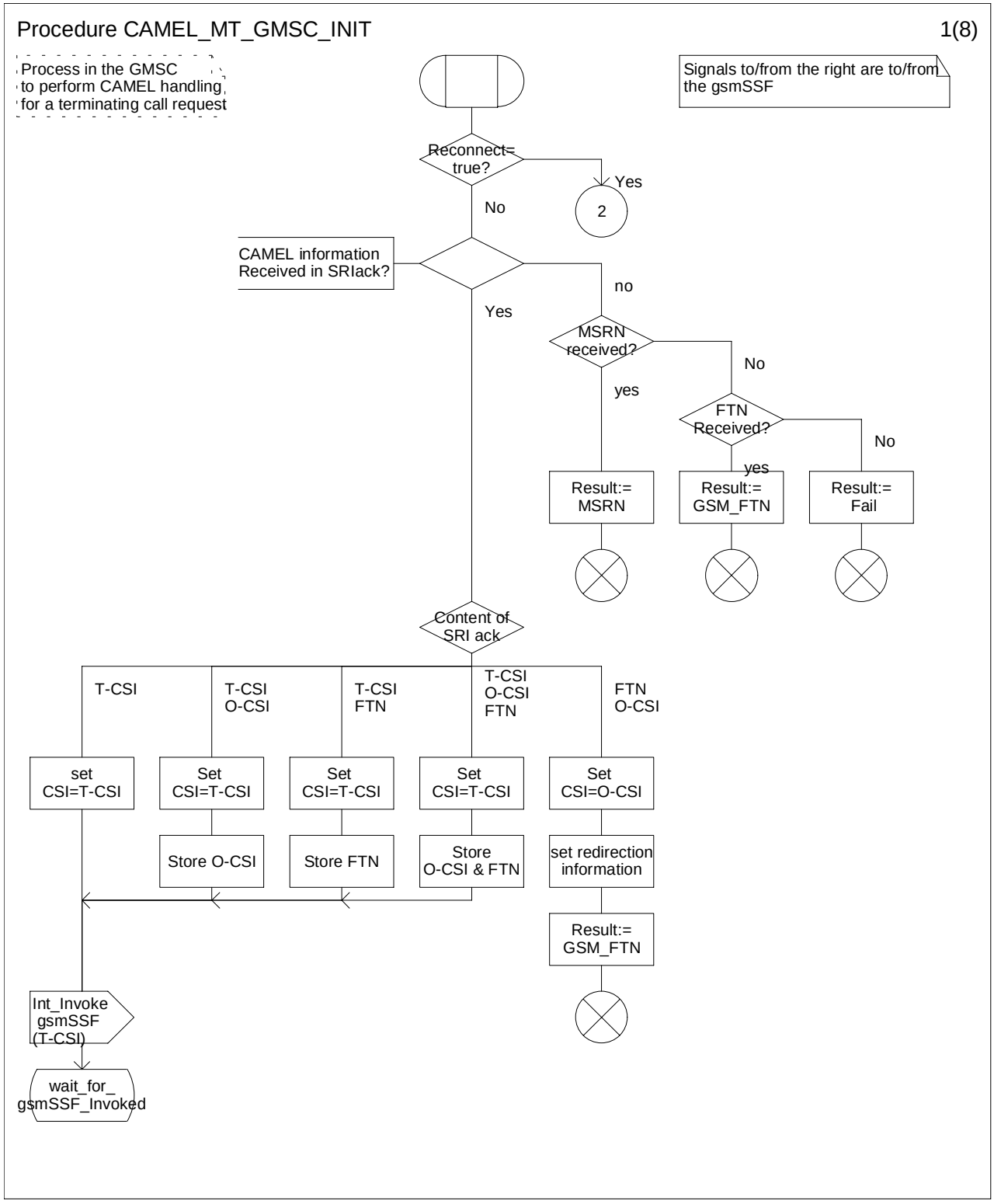

Figure 24a: Procedure CAMEL_MT_GMSC_INIT (sheet 1)

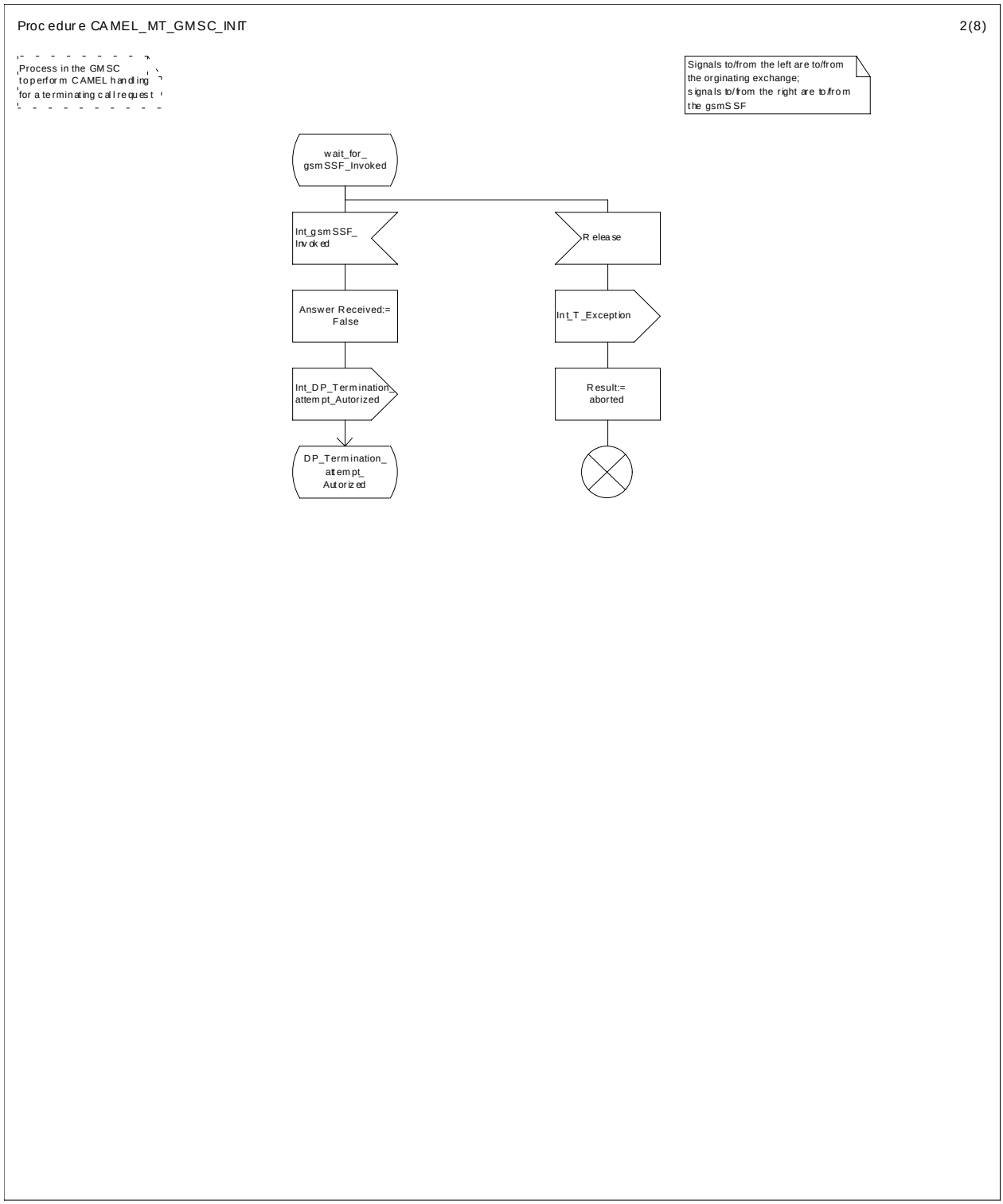

Figure 24b: Procedure CAMEL_MT_GMSC_INIT (sheet 2)

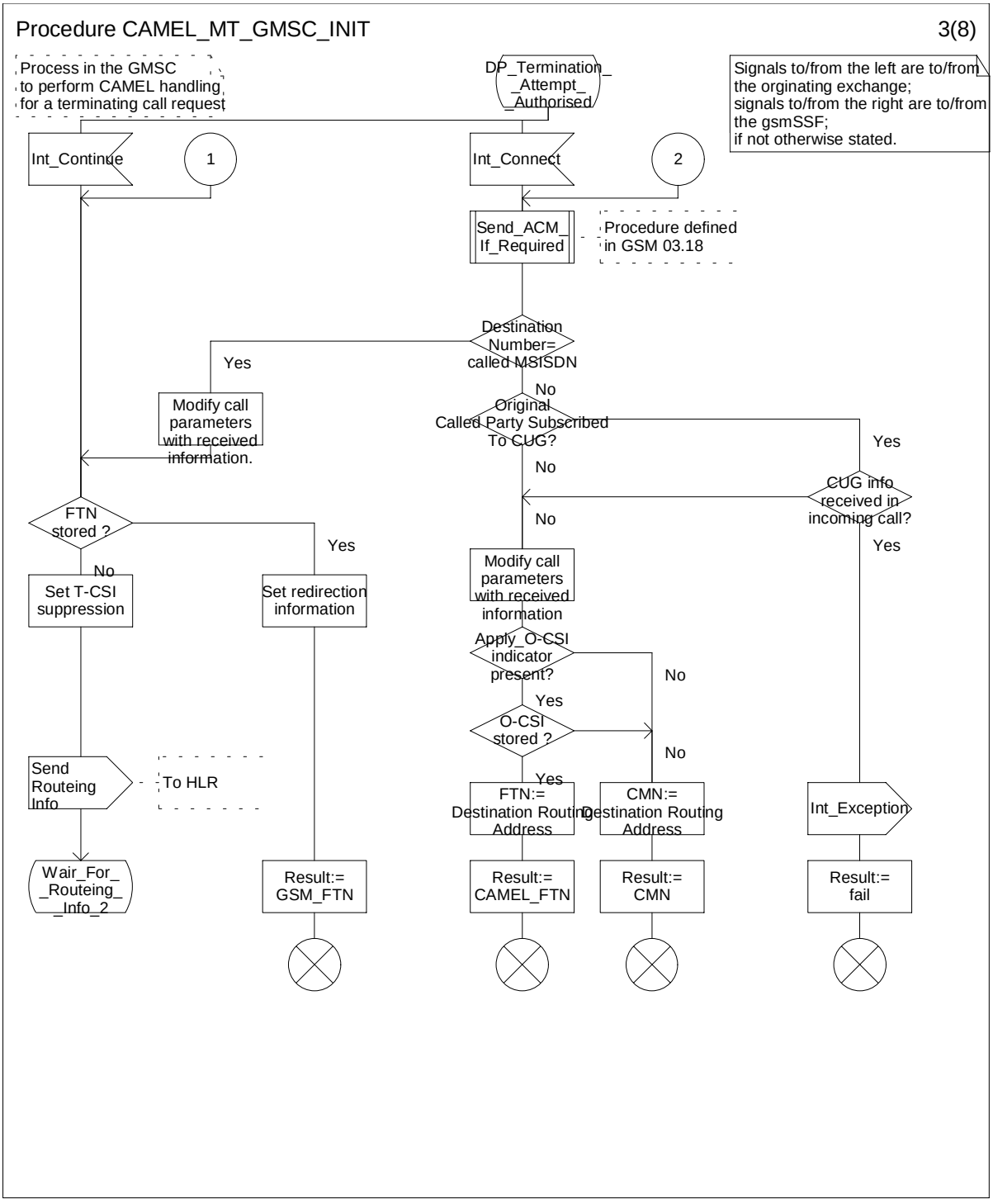

Figure 24c: Procedure CAMEL_MT_GMSC_INIT (sheet 3)

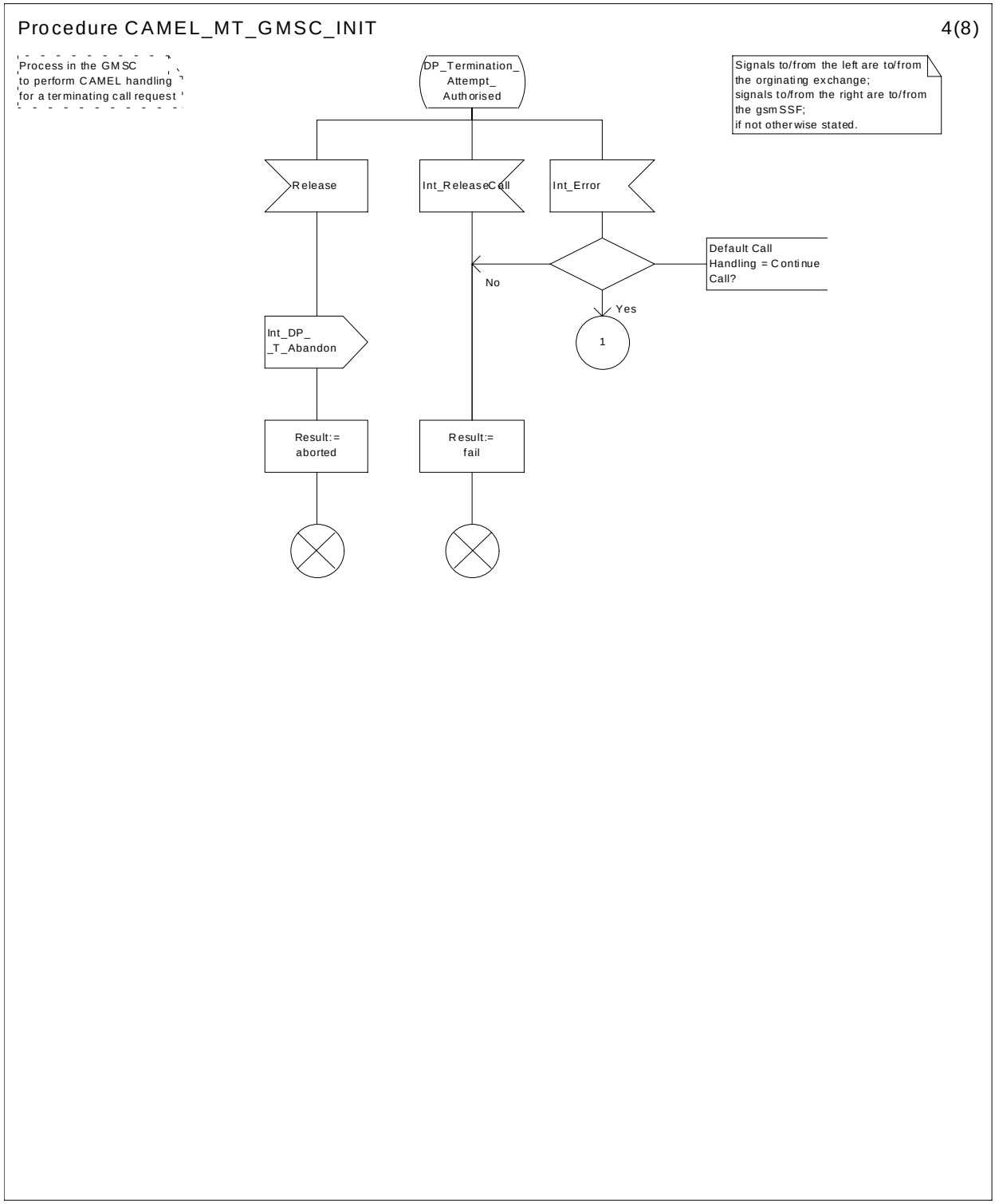

Figure 24d: Procedure CAMEL_MT_GMSC_INIT (sheet 4)

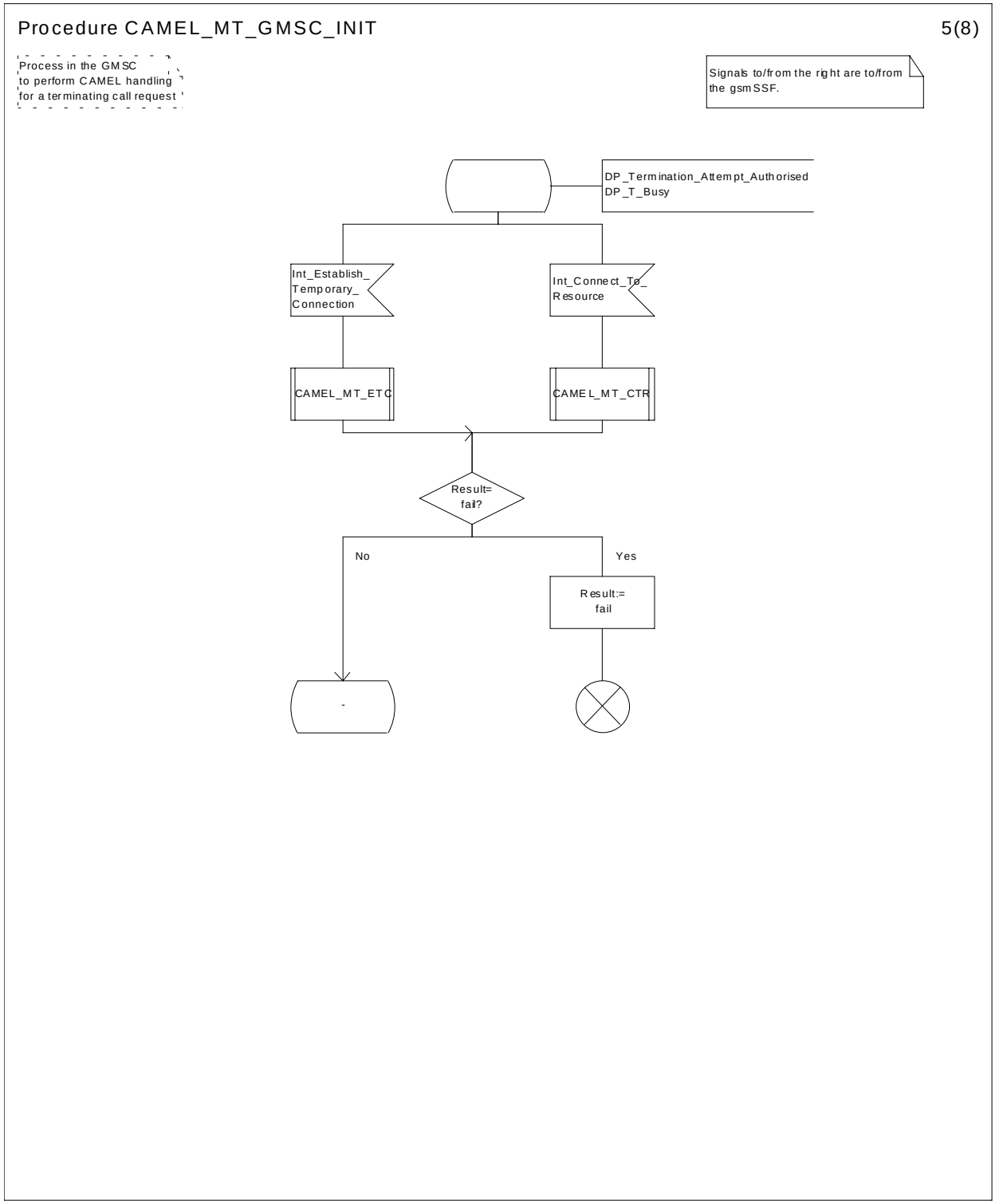

Figure 24e: Procedure CAMEL_MT_GMSC_INIT (sheet 5)

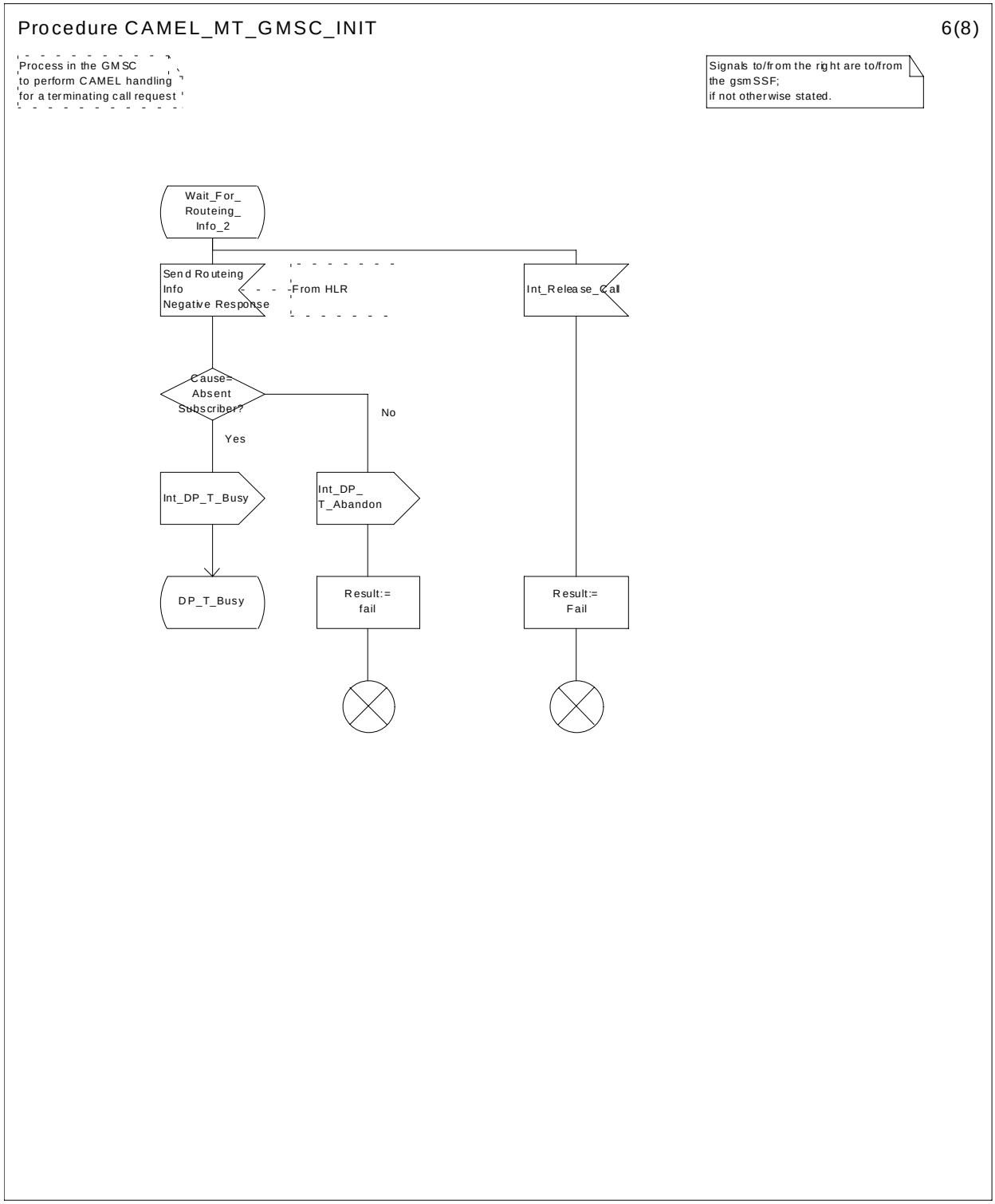

Figure 24f: Procedure CAMEL_MT_GMSC_INIT (sheet 6)

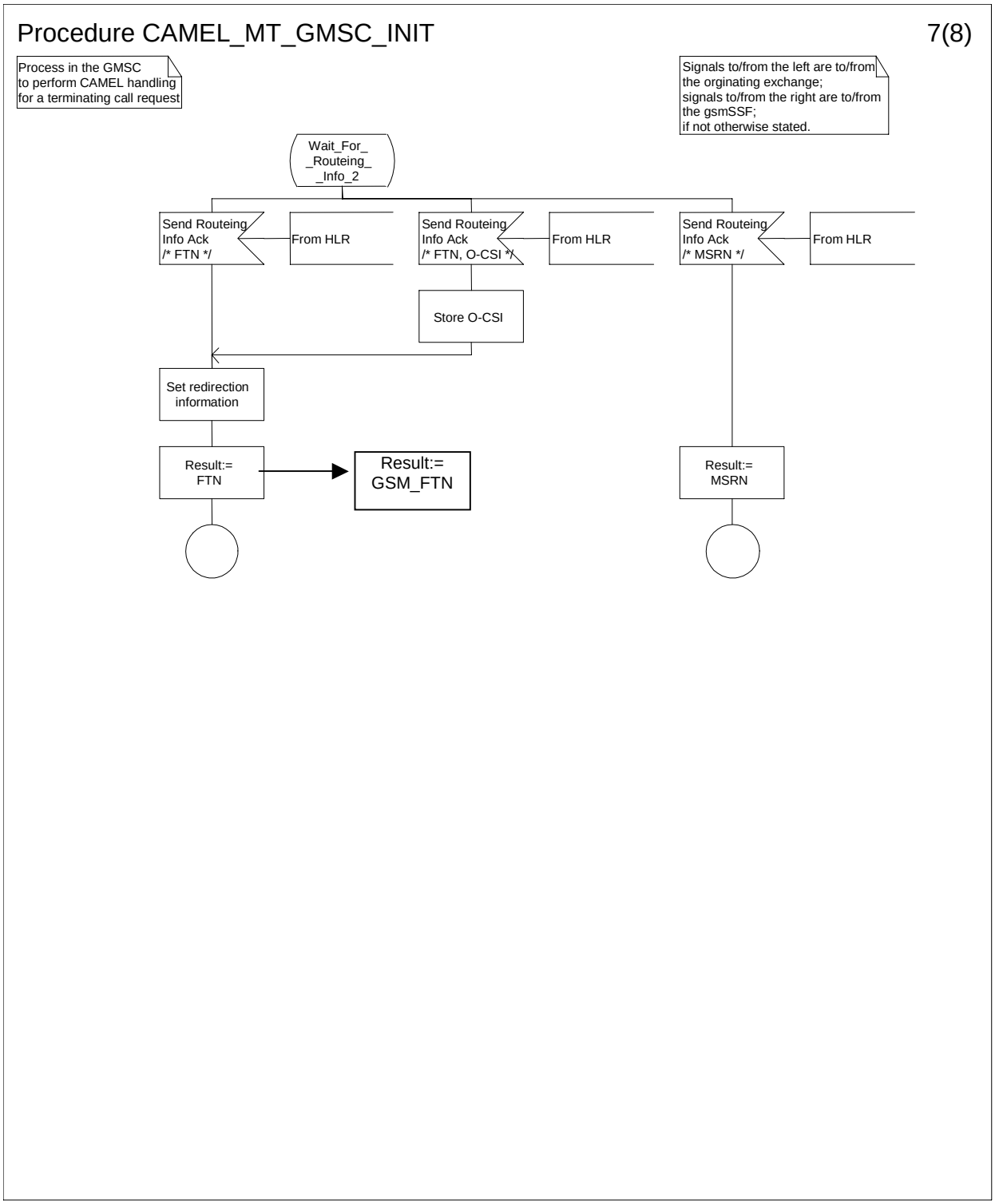

Figure 24g: Procedure CAMEL_MT_GMSC_INIT (sheet 7)

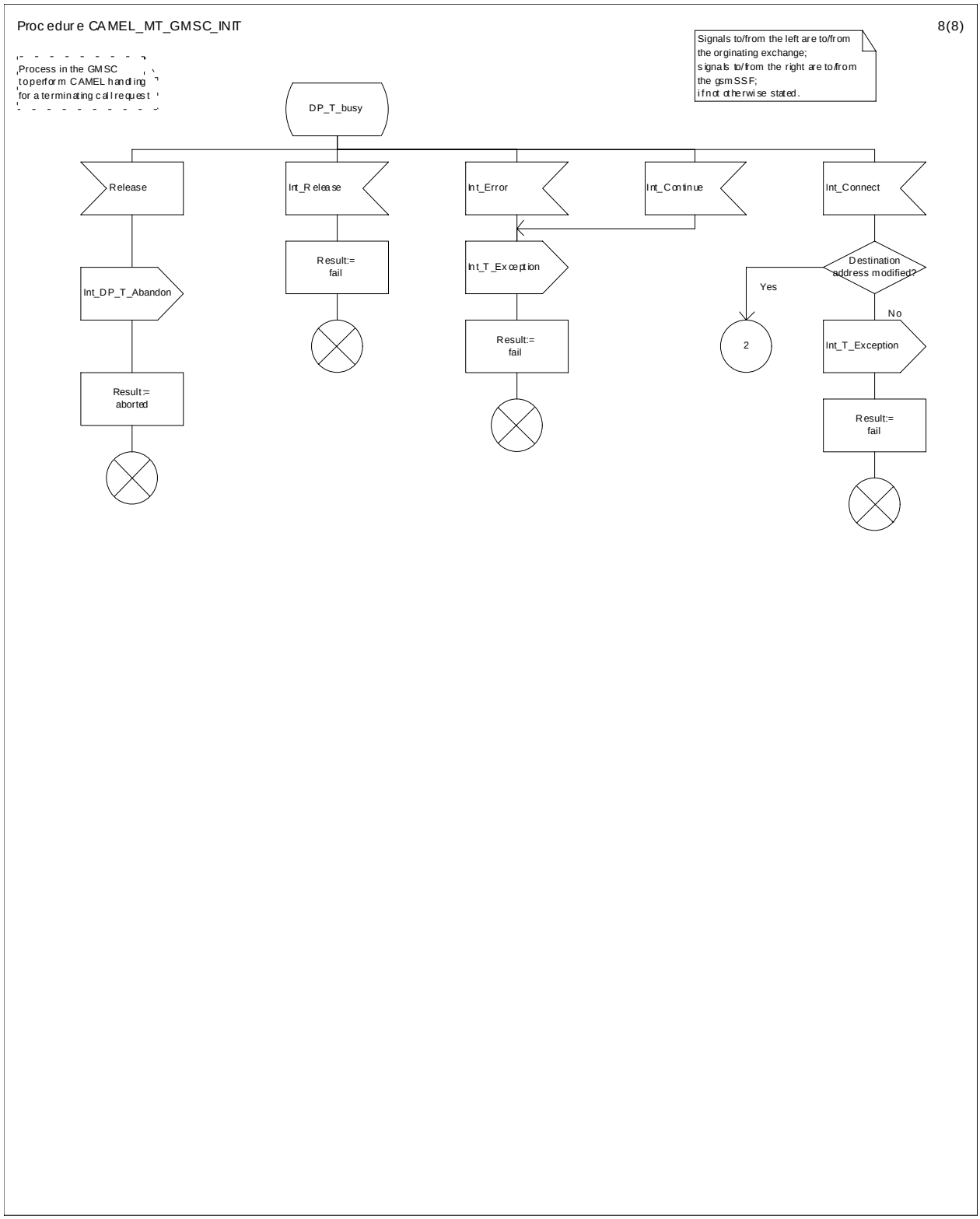

Figure 24h: Procedure CAMEL_MT_GMSC_INIT (sheet 8)

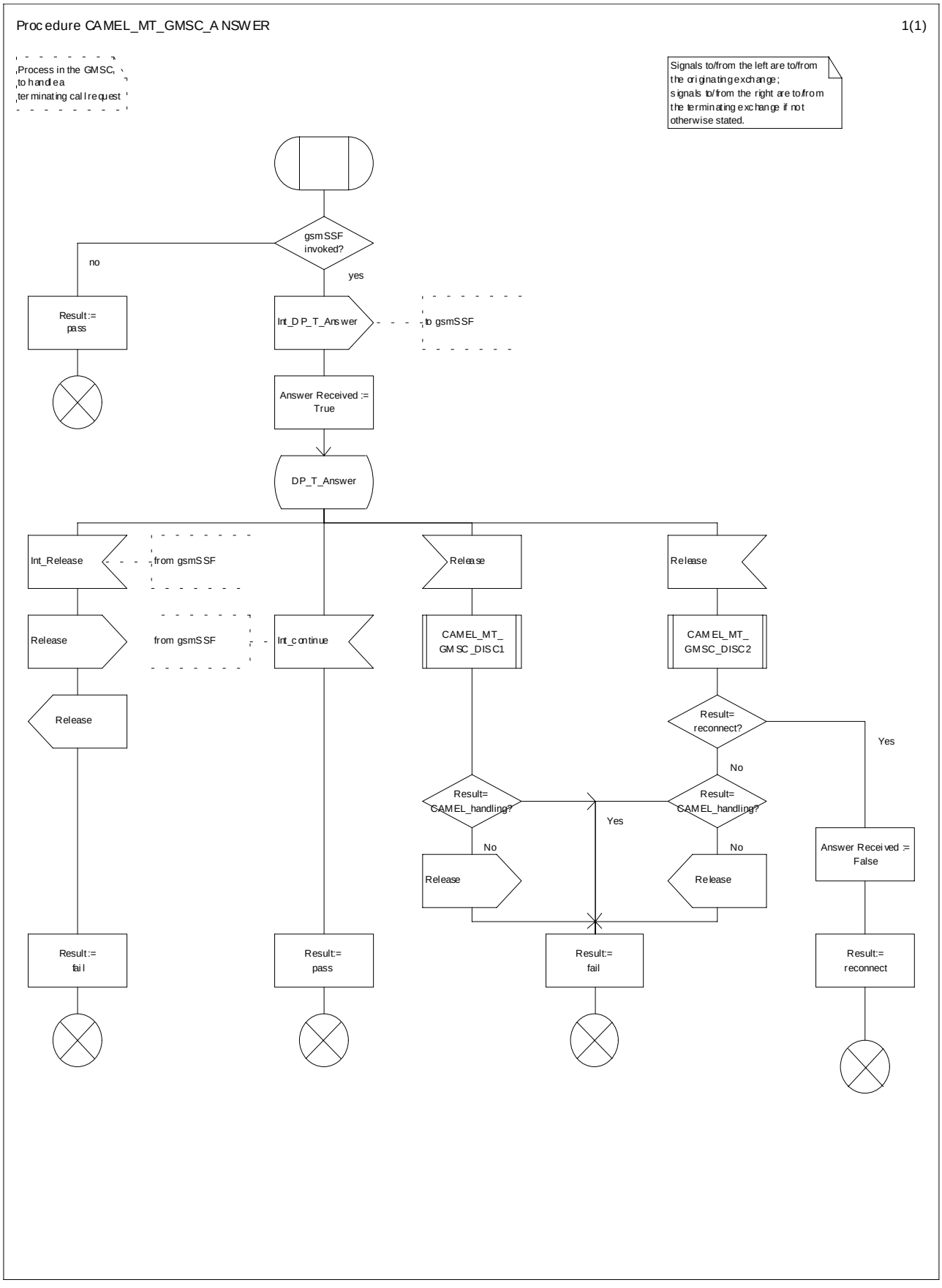

Figure 25a: Procedure CAMEL_MT_GMSC_ANSWER (sheet 1)

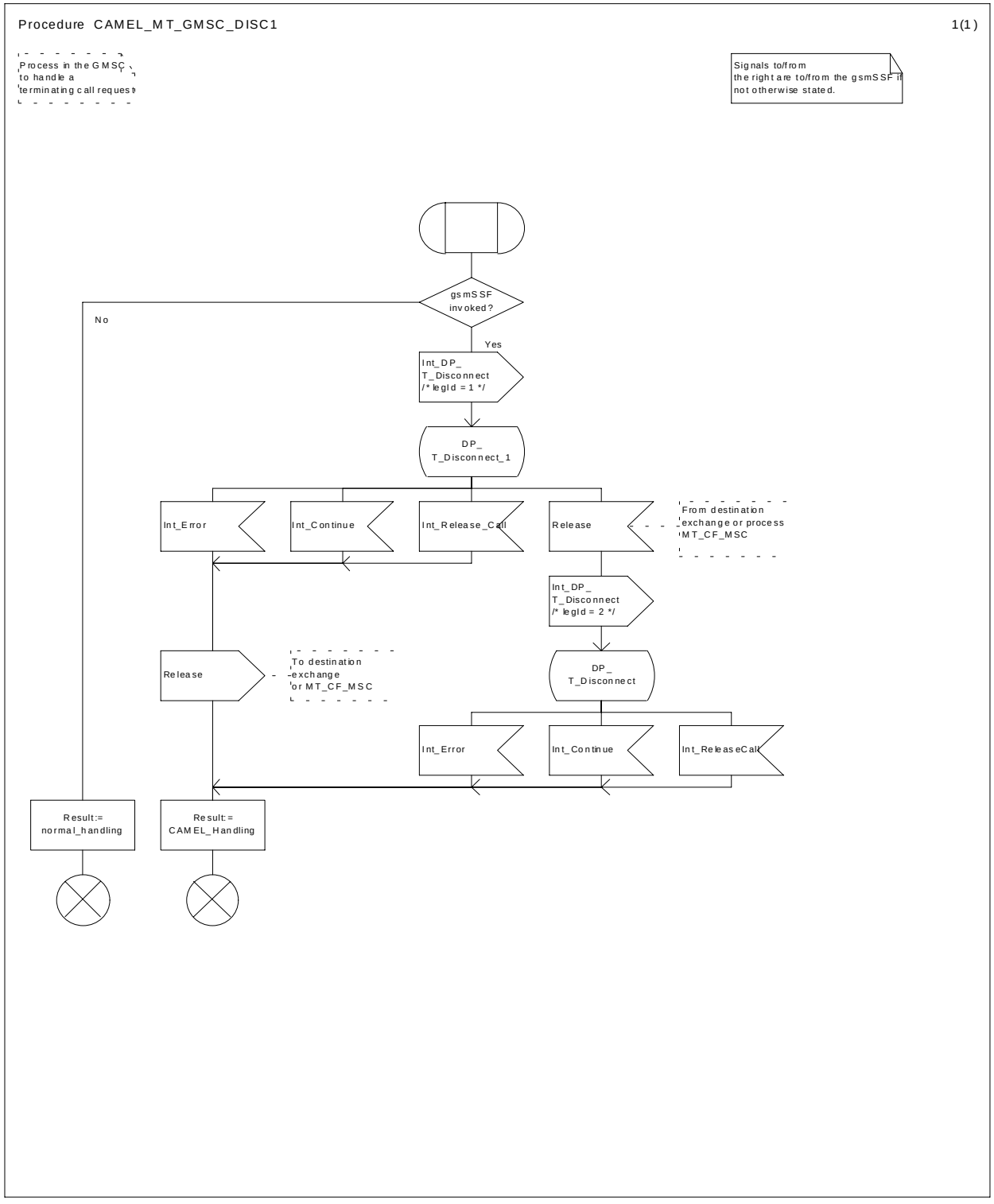

Figure 26a: Procedure CAMEL_MT_GMSC_DISC1 (sheet 1)

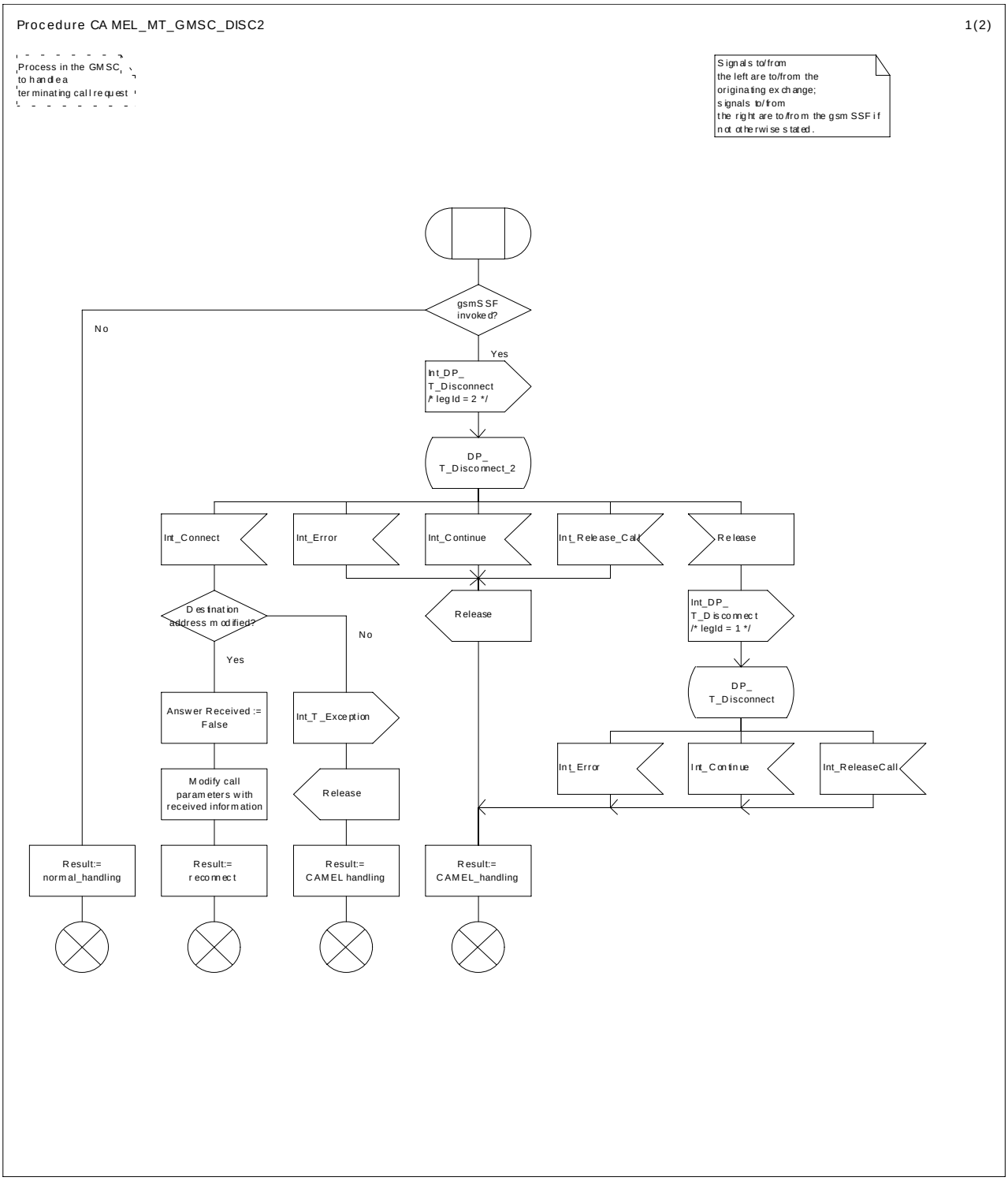

Figure 27a: Procedure CAMEL_MT_GMSC_DISC2 (sheet 1)

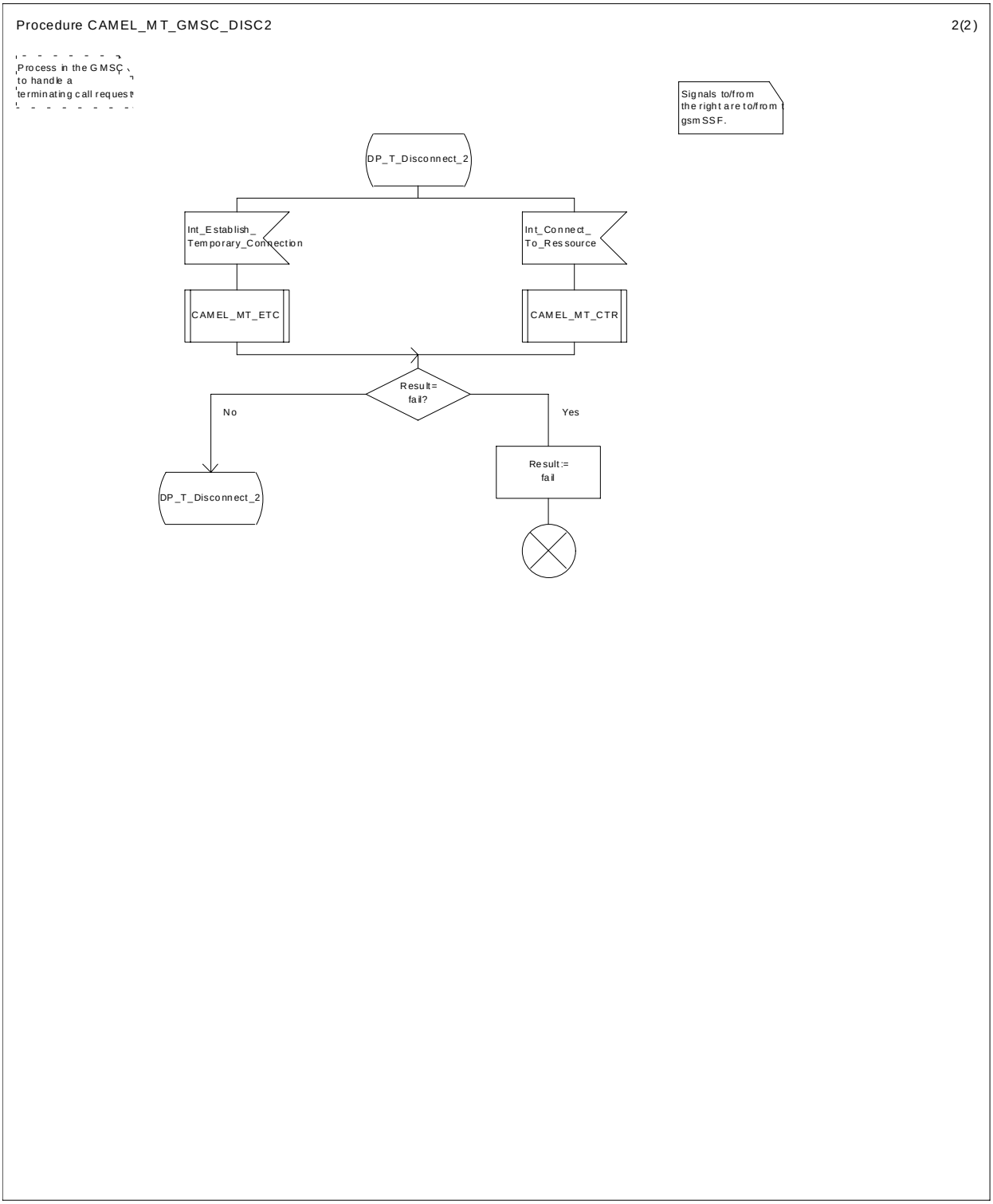

Figure 27b: Procedure CAMEL_MT_GMSC_DISC2 (sheet 2)

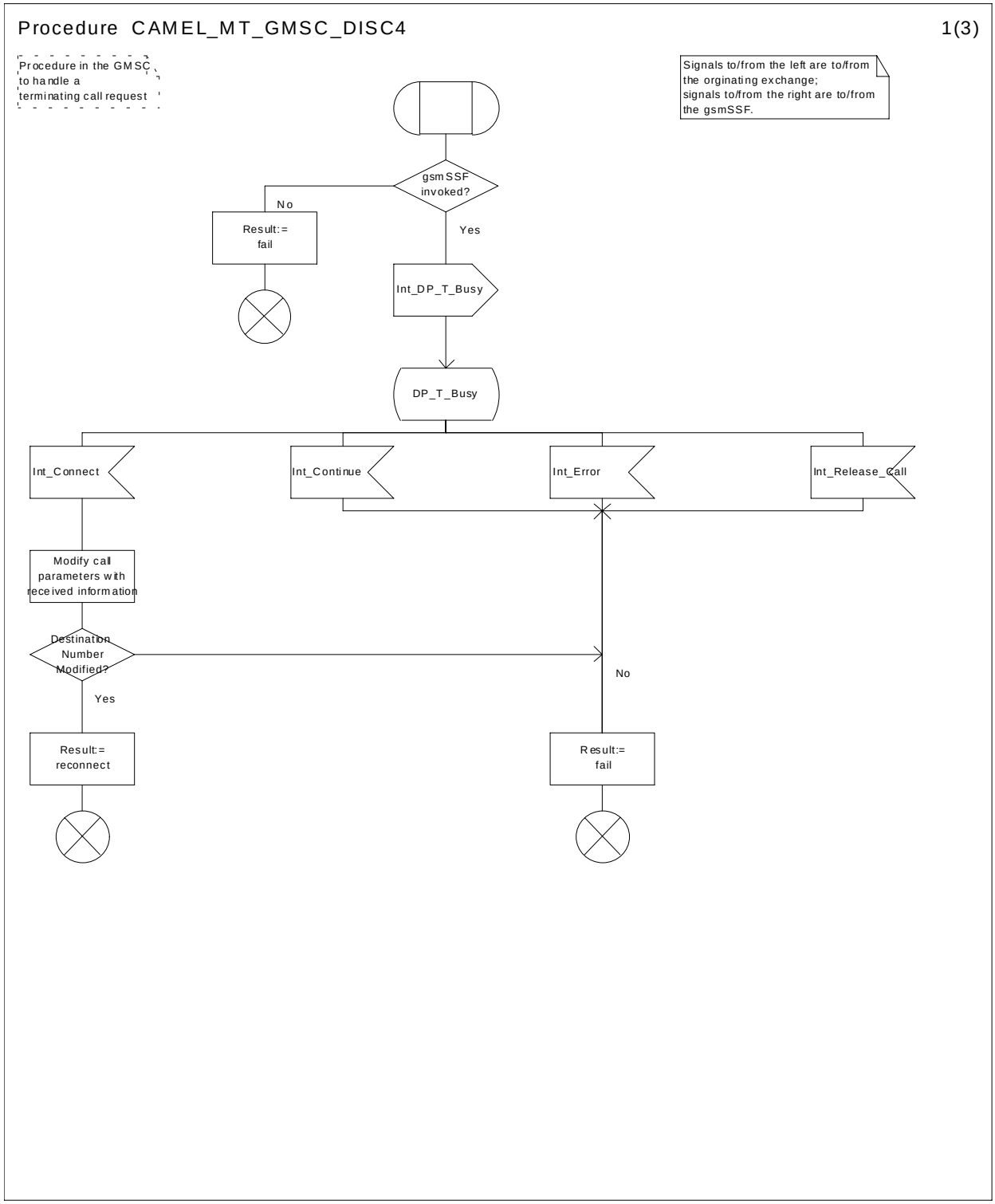

Figure 28a: Procedure CAMEL_MT_GMSC_DISC4 (sheet 1)

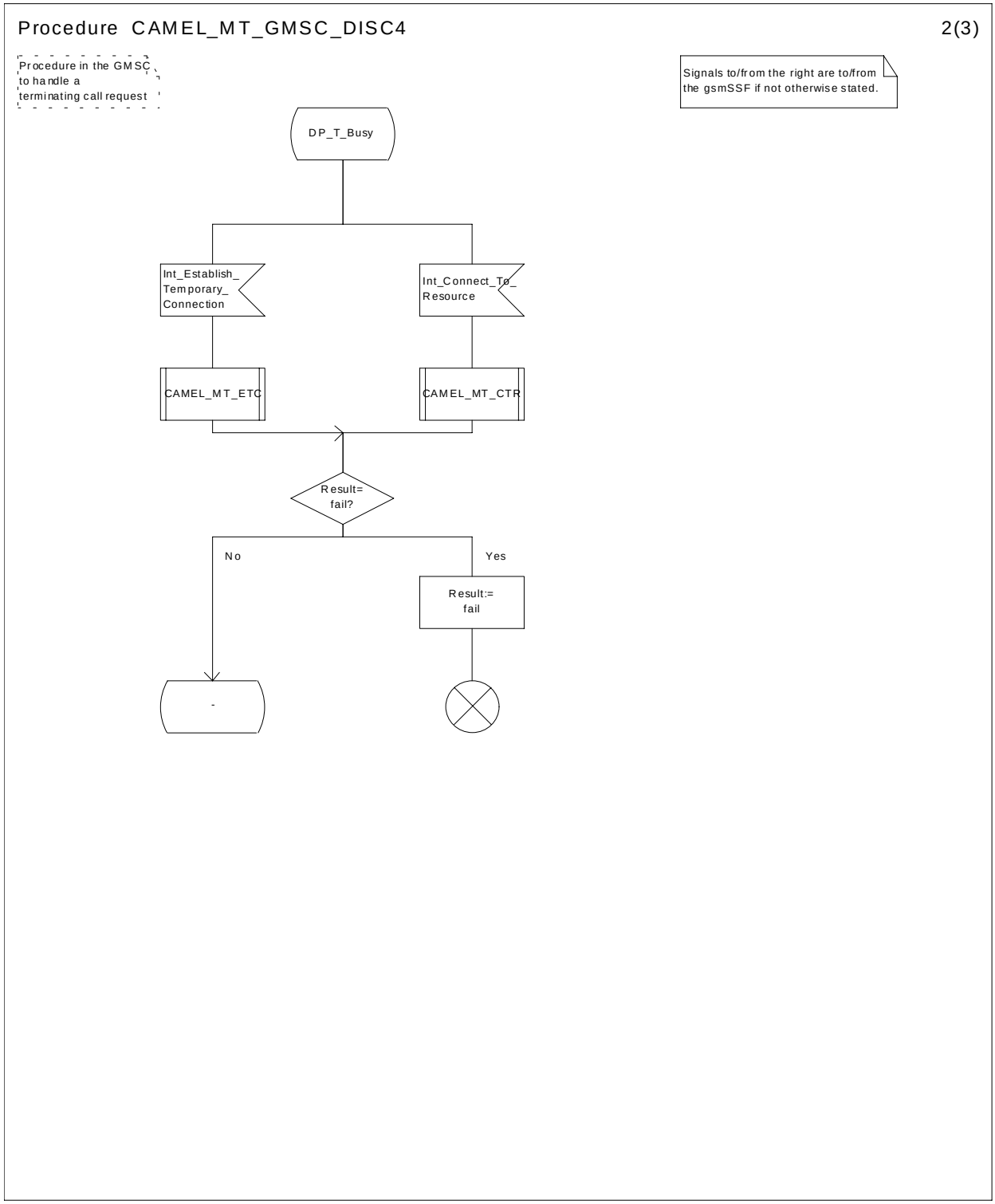

Figure 28b: Procedure CAMEL_MT_GMSC_DISC4 (sheet 2)

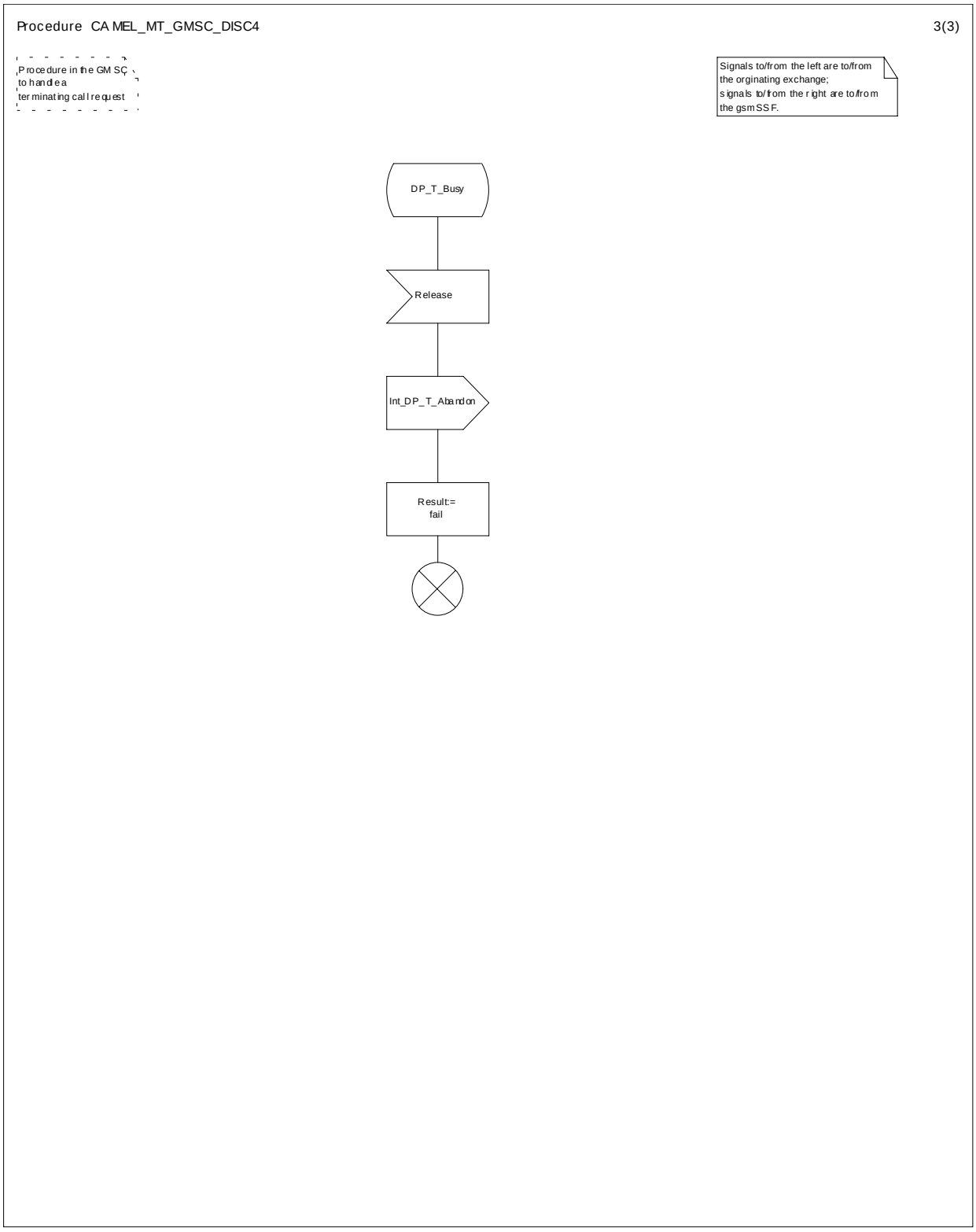

Figure 28c: Procedure CAMEL_MT_GMSC_DISC4 (sheet 3)

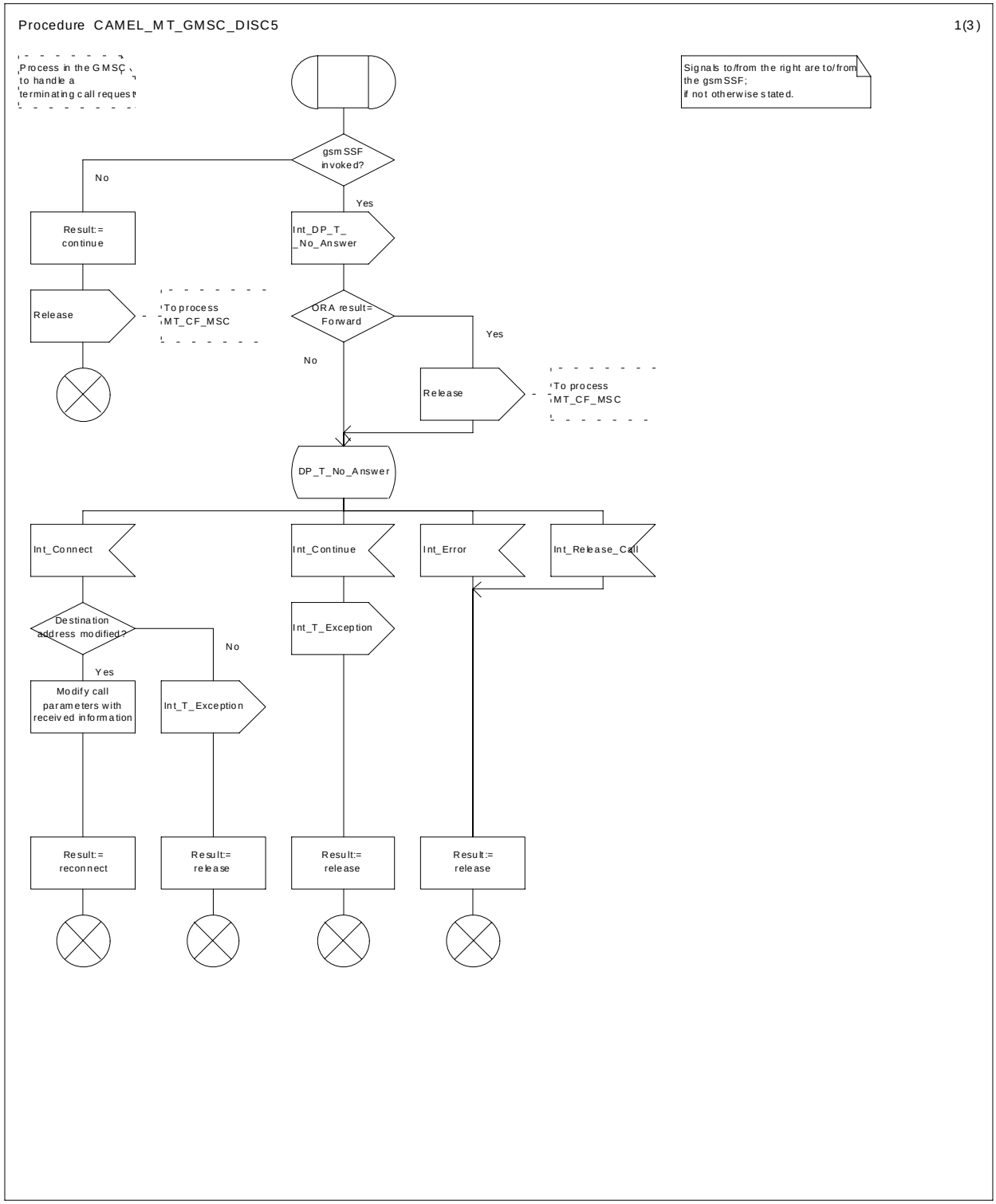

Figure 29a: Procedure CAMEL_MT_GMSC_DISC5 (sheet 1)

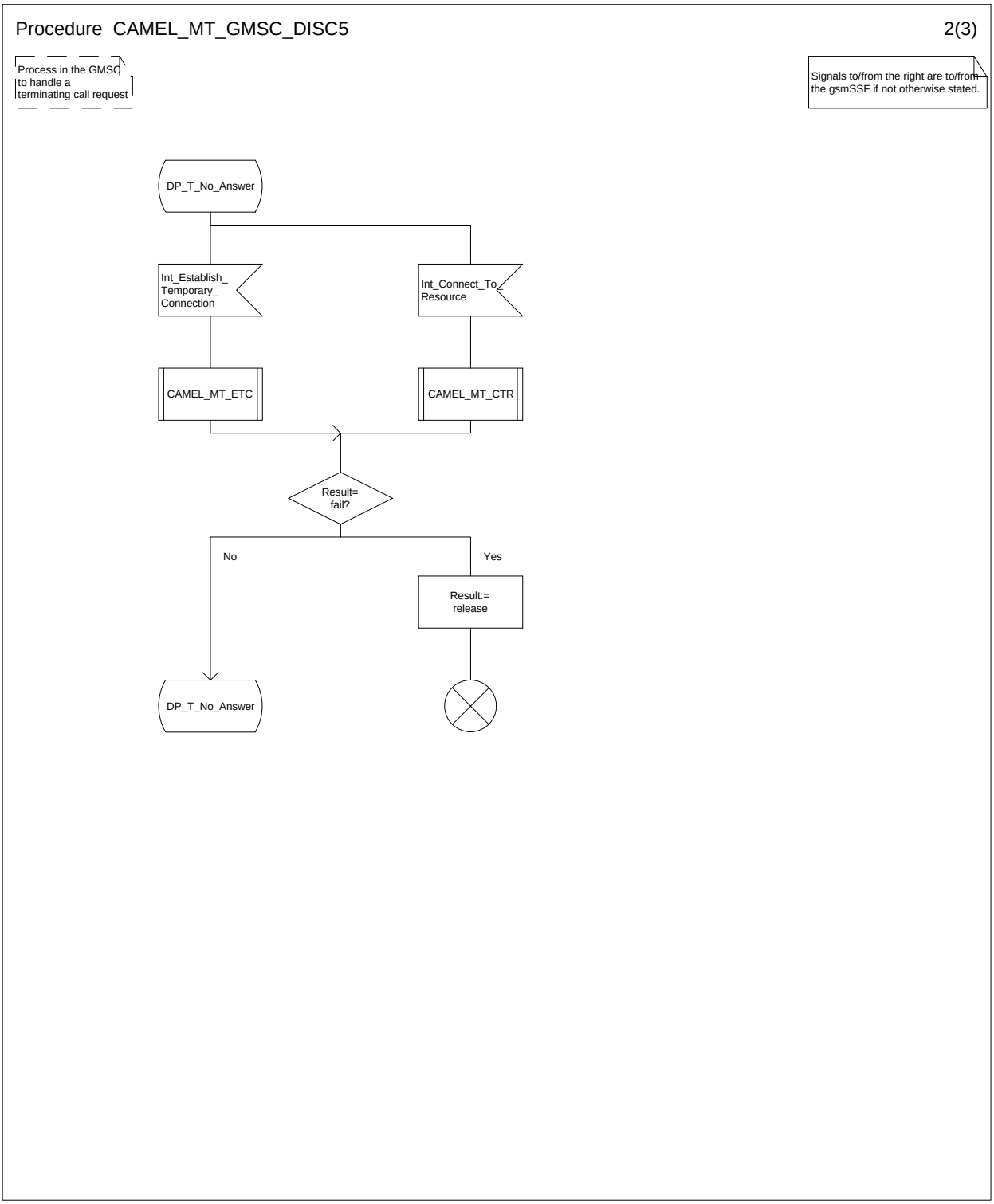

Figure 29b: Procedure CAMEL_MT_GMSC_DISC5 (sheet 2)

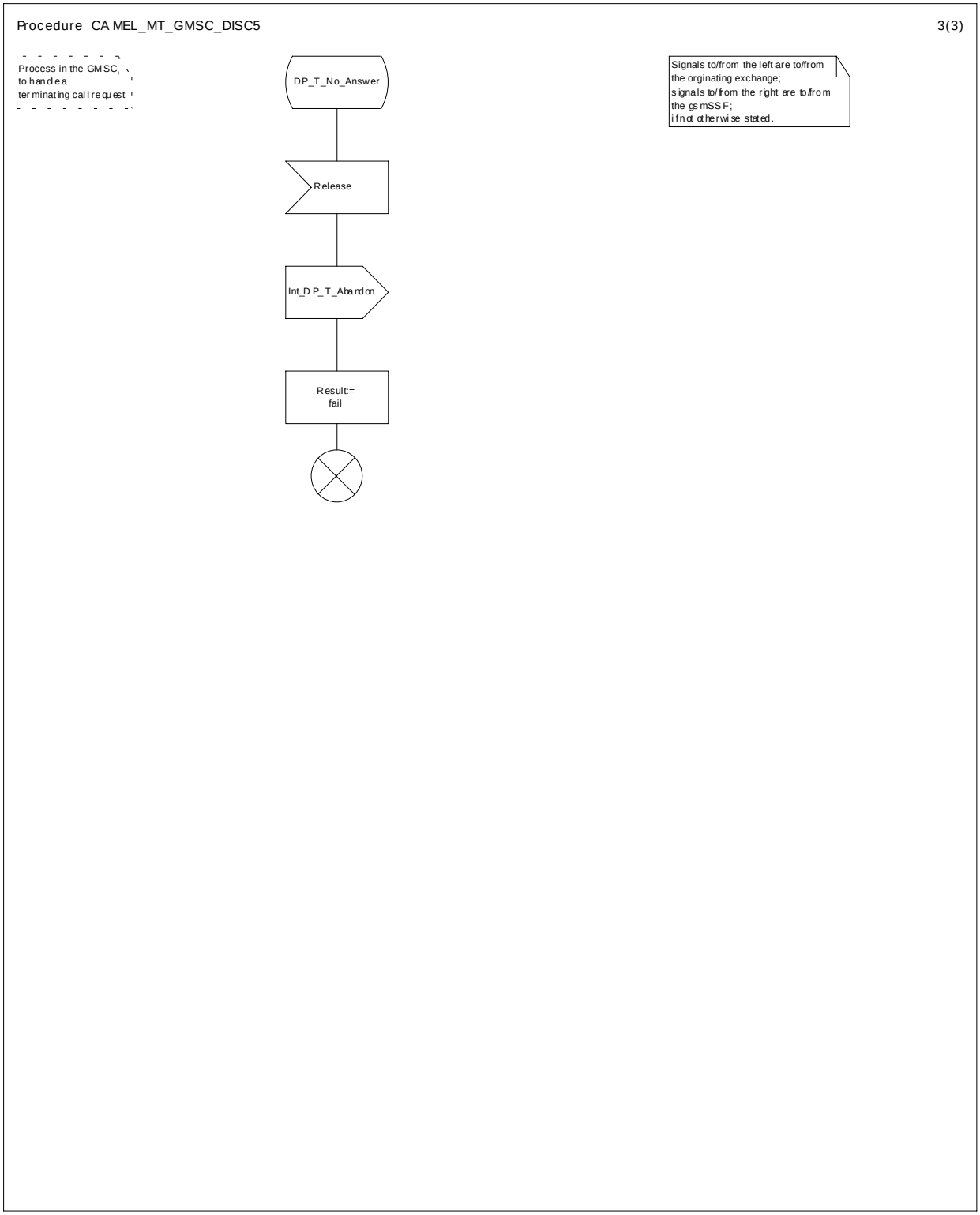

Figure 29c: Procedure CAMEL_MT_GMSC_DISC5 (sheet 3)

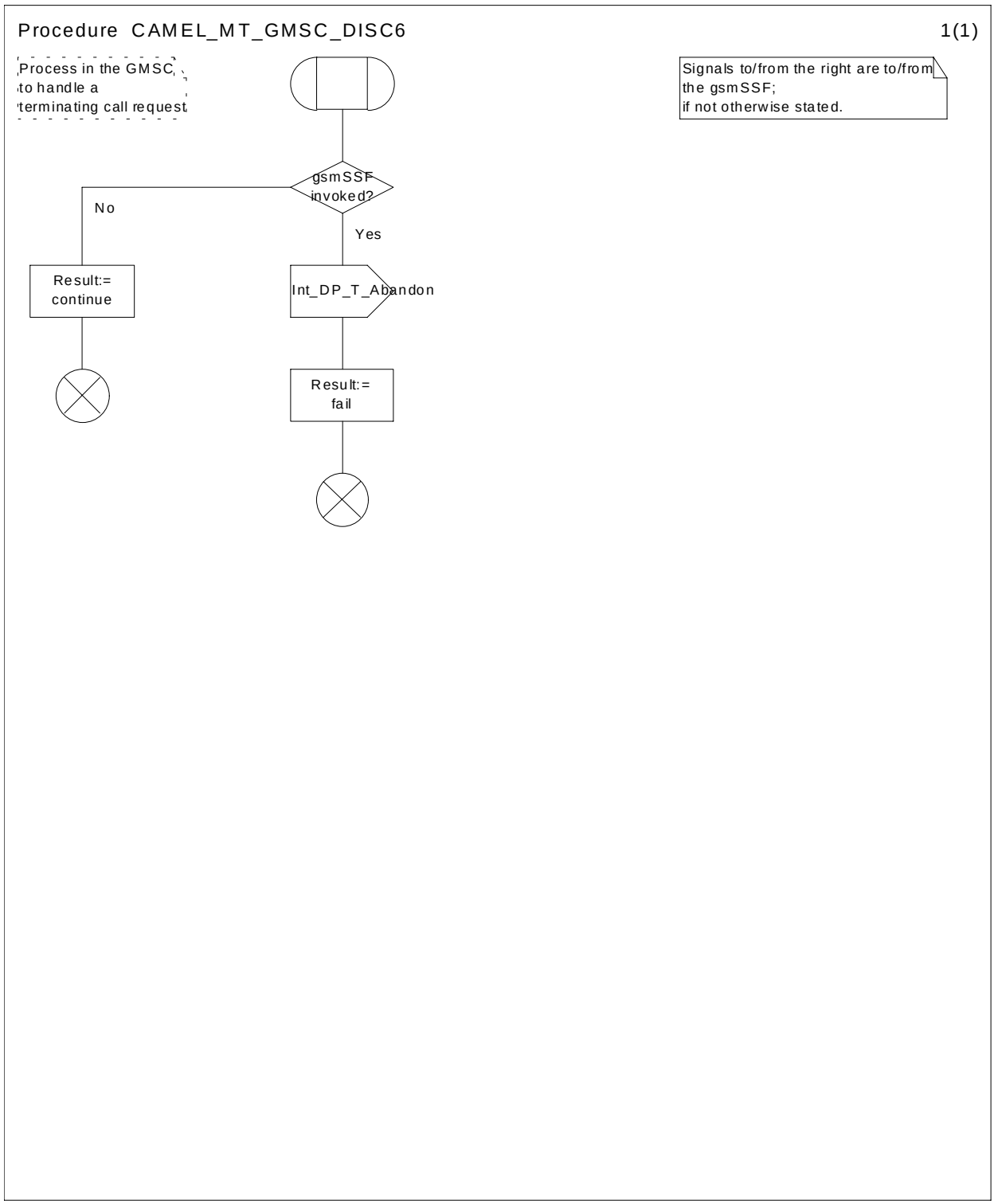

Figure 30a: Procedure CAMEL_MT_GMSC_DISC6 (sheet 1)

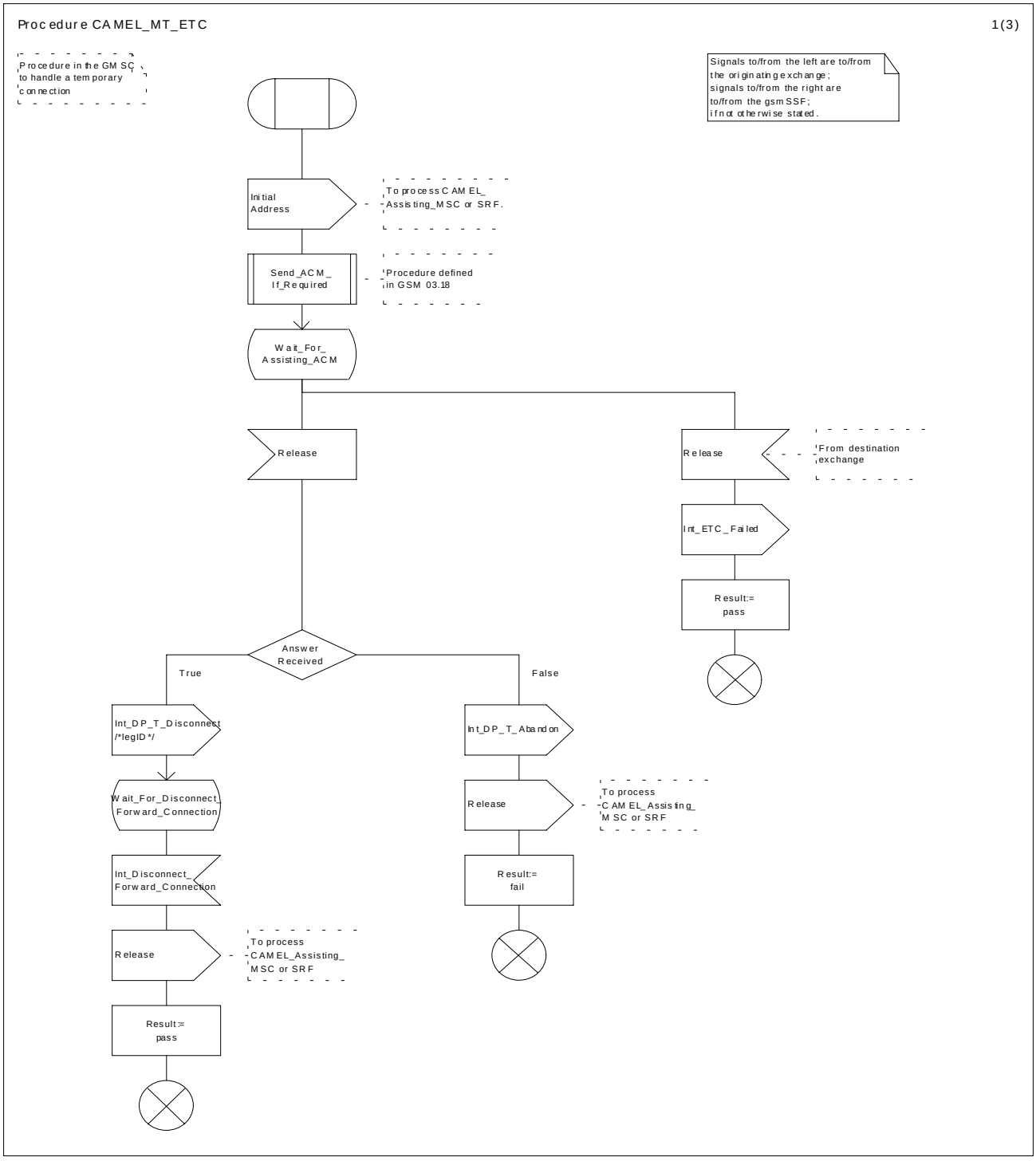

Figure 31a: Procedure CAMEL_MT_ETC (sheet 1)

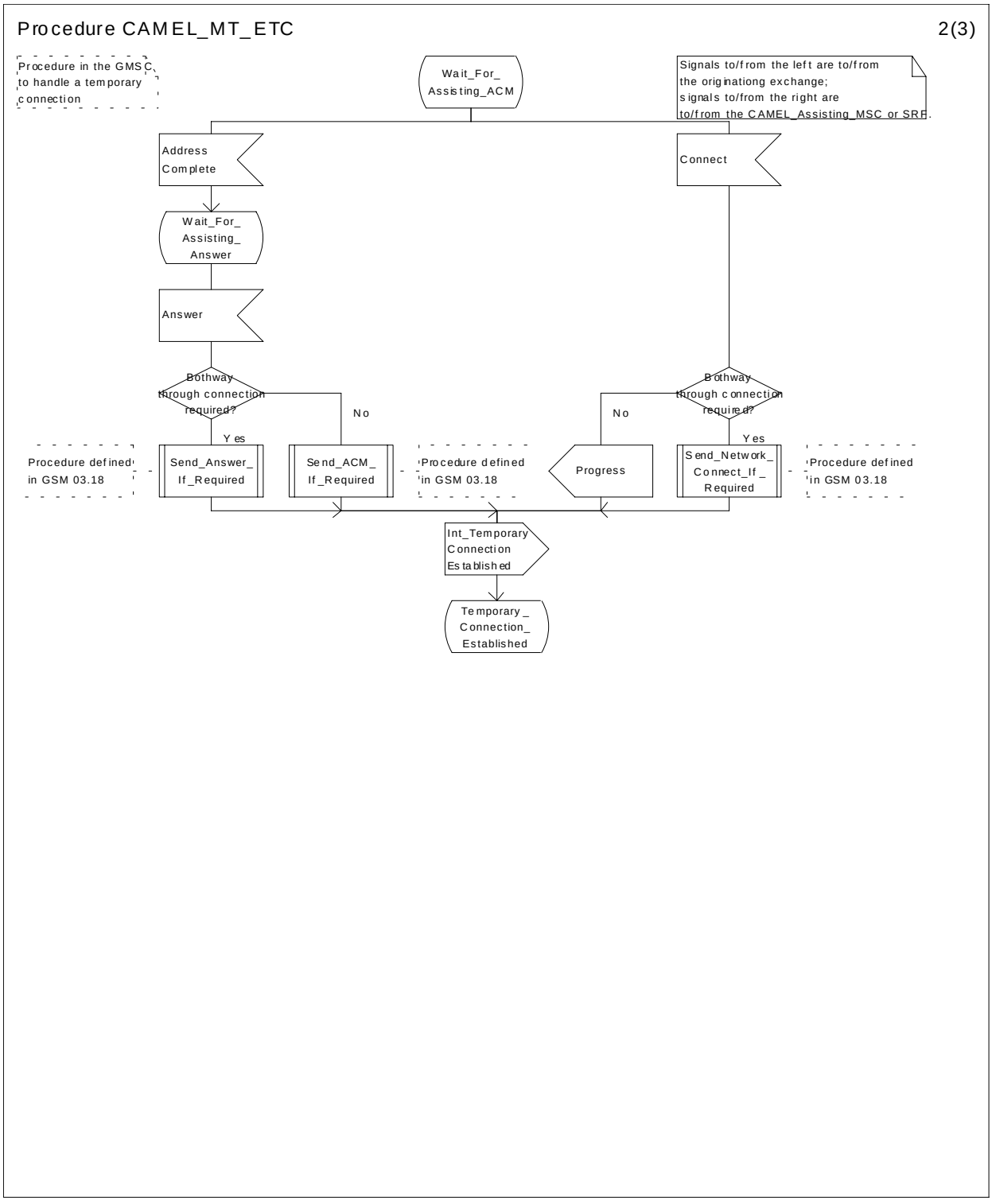

Figure 31b: Procedure CAMEL_MT_ETC (sheet 2)

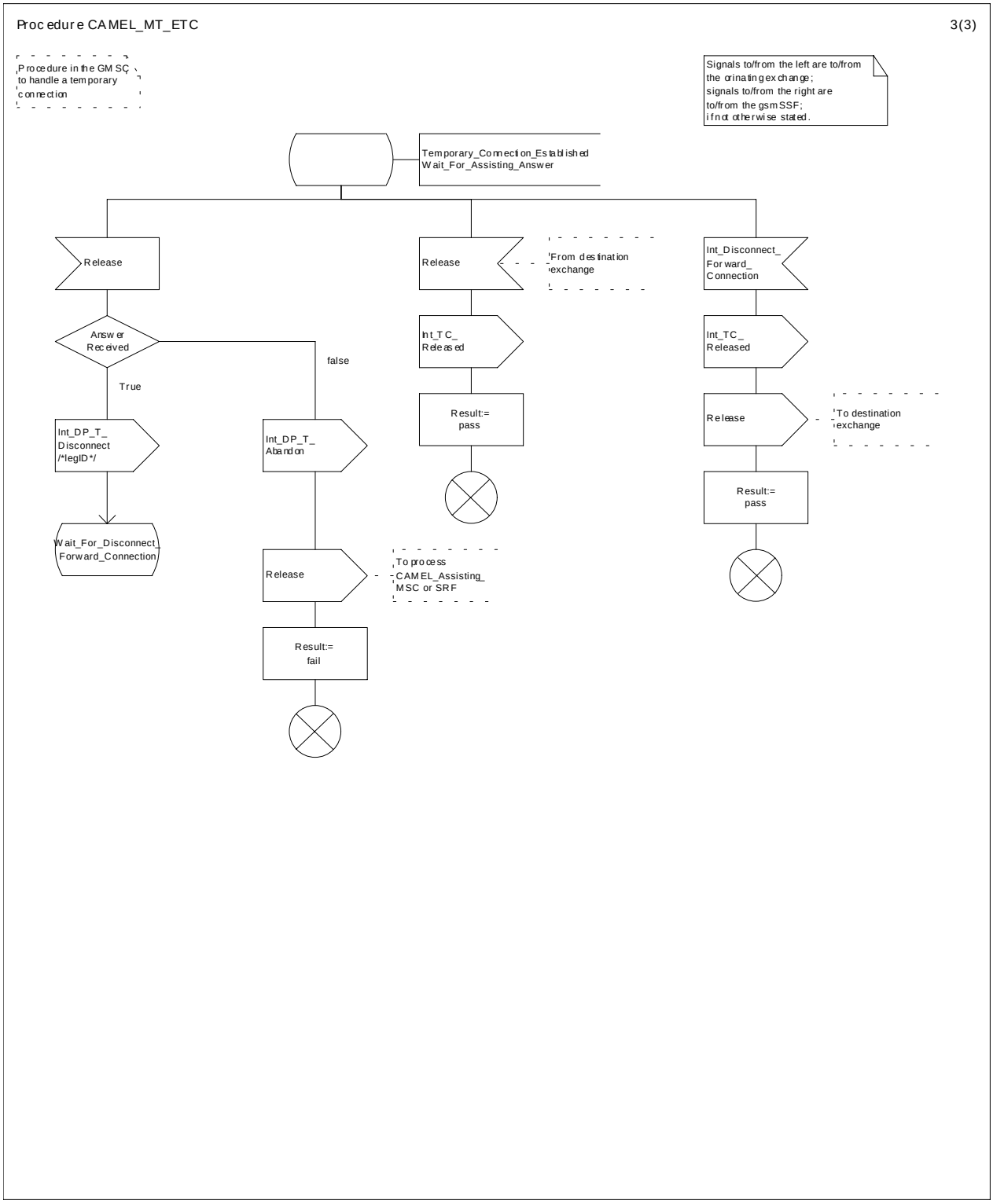

Figure 31c: Procedure CAMEL_MT_ETC (sheet 3)

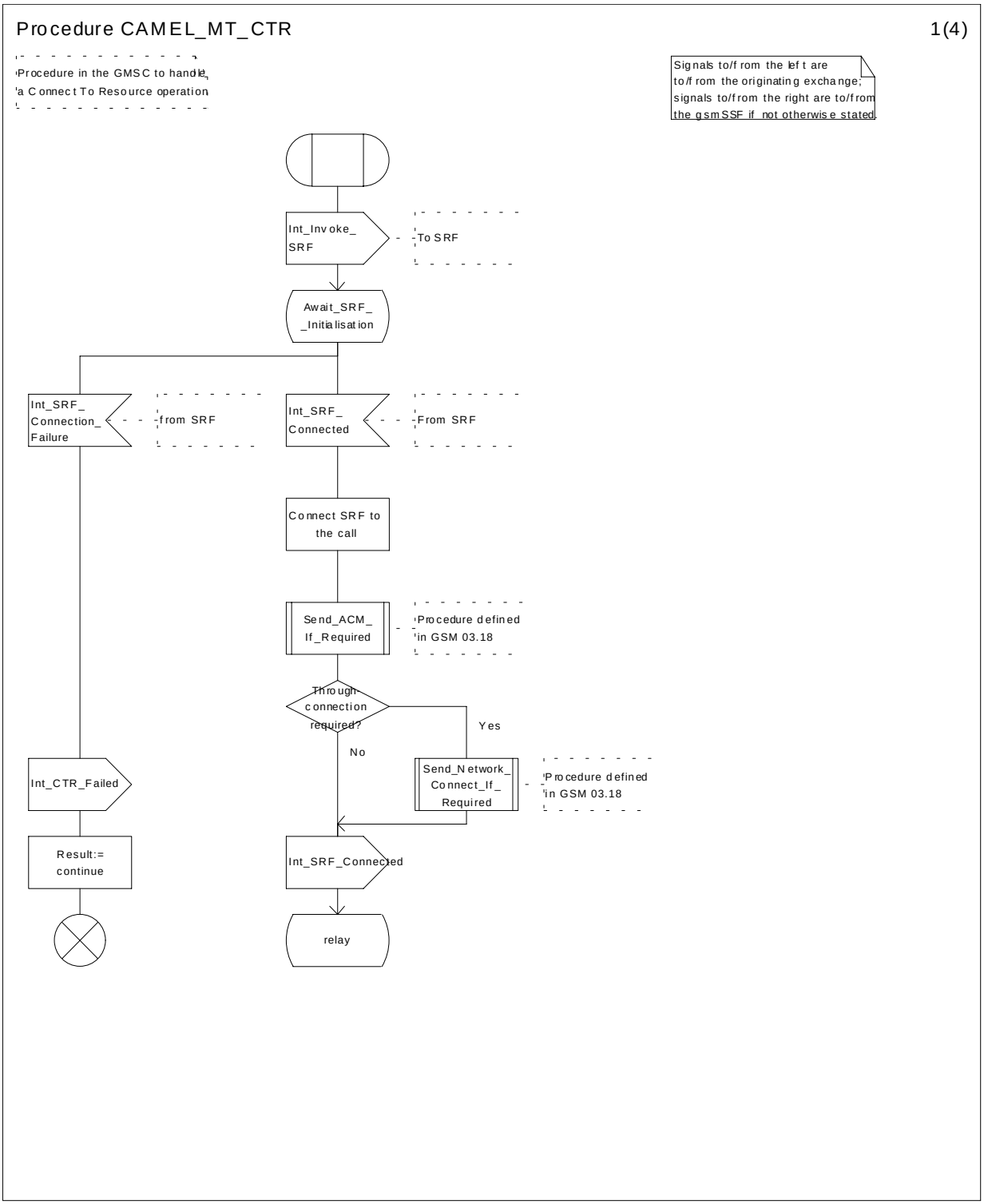

Figure 32a: Procedure CAMEL_MT_CTR (sheet 1)

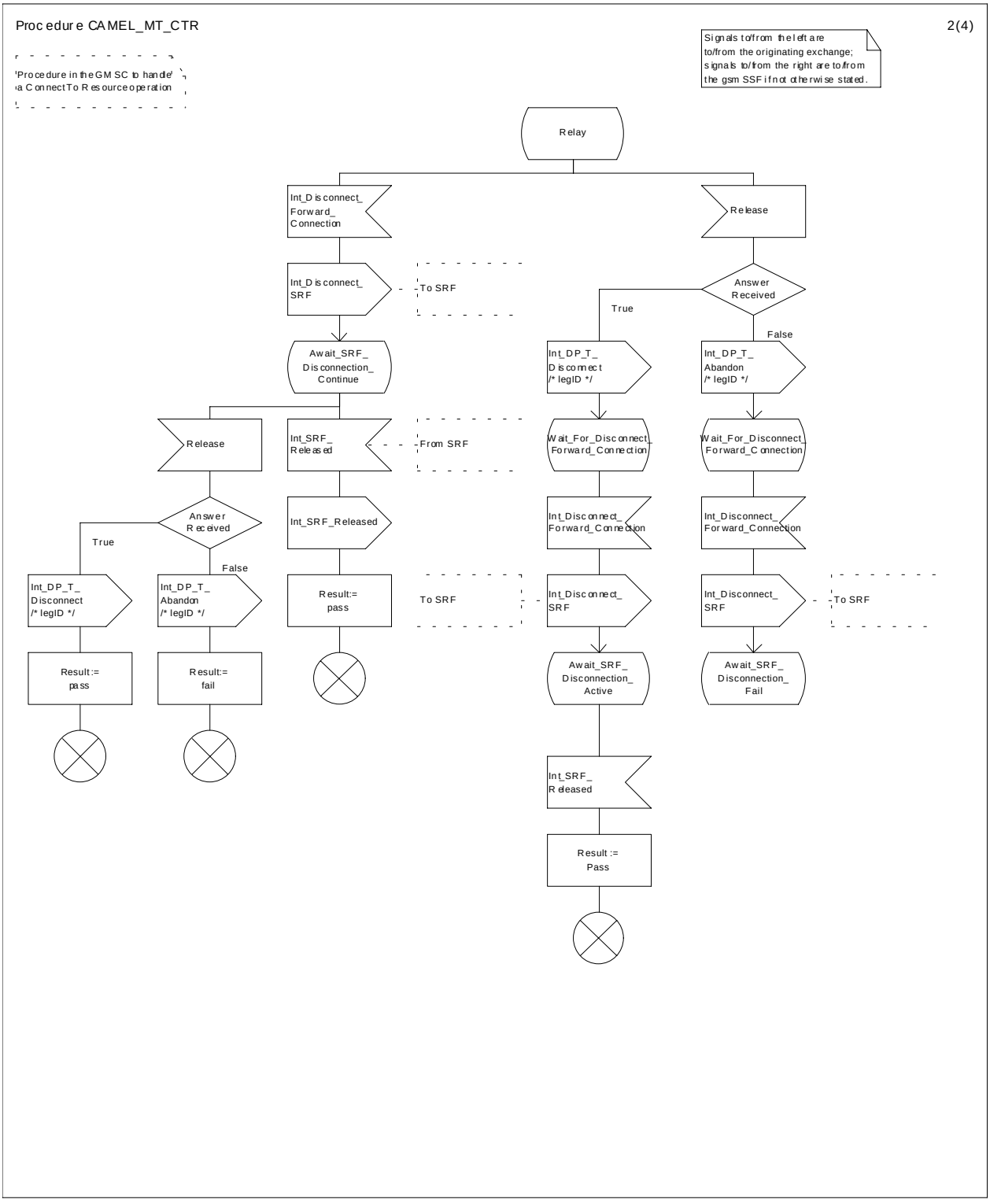

Figure 32b: Procedure CAMEL_MT_CTR (sheet 2)

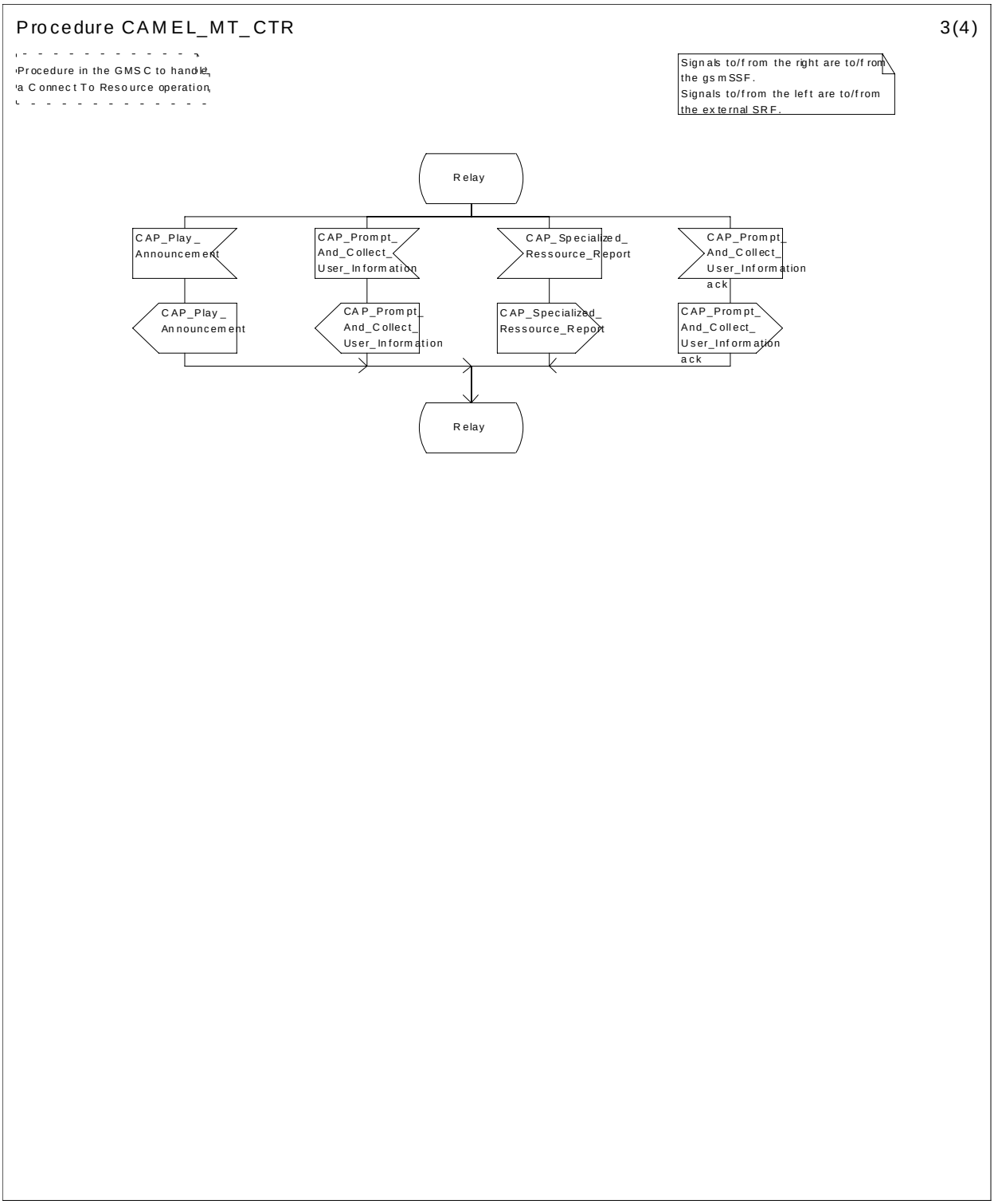

Figure 32c: Procedure CAMEL_MT_CTR (sheet 3)

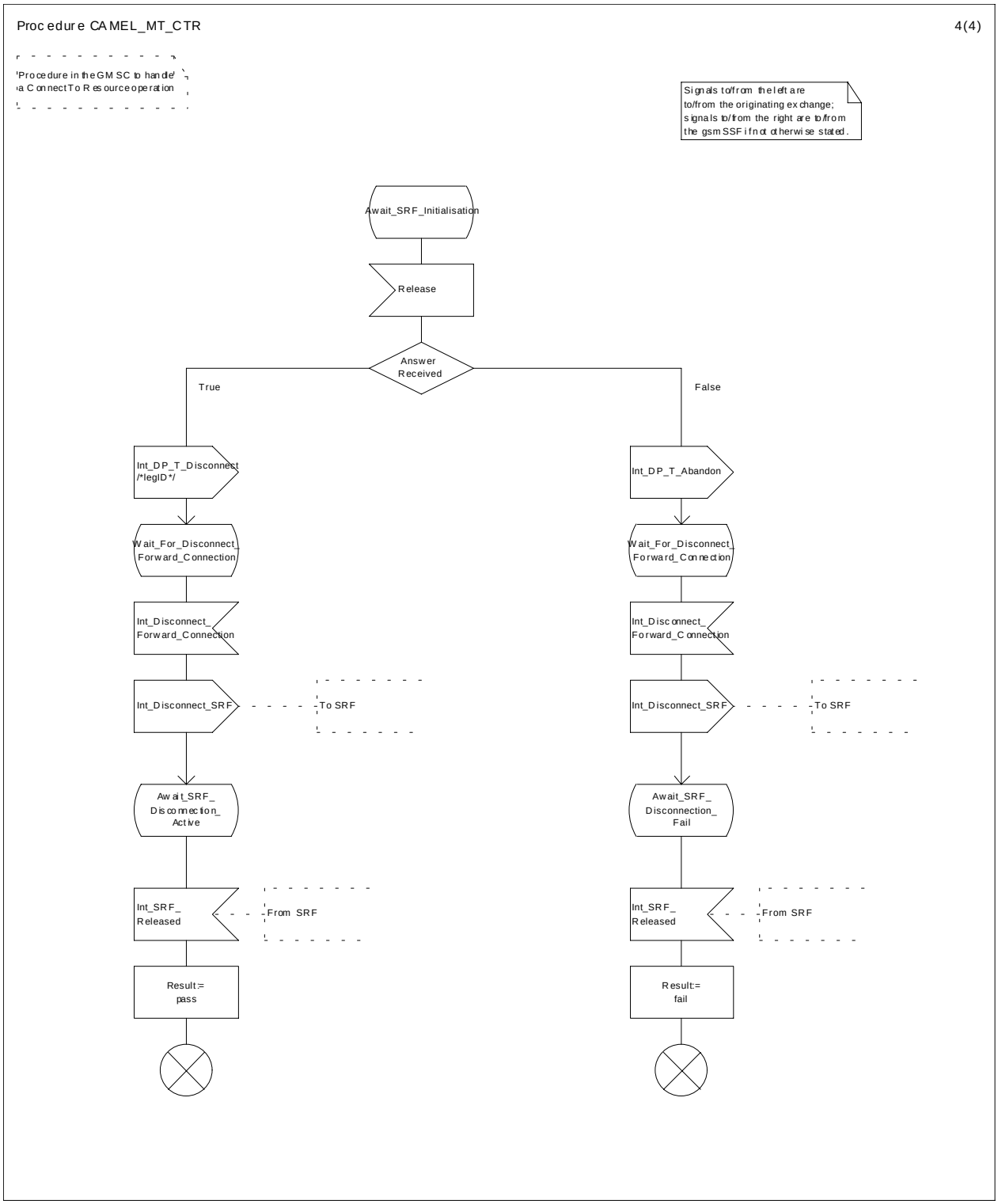

Figure 32d: Procedure CAMEL_MT_CTR (sheet 4)

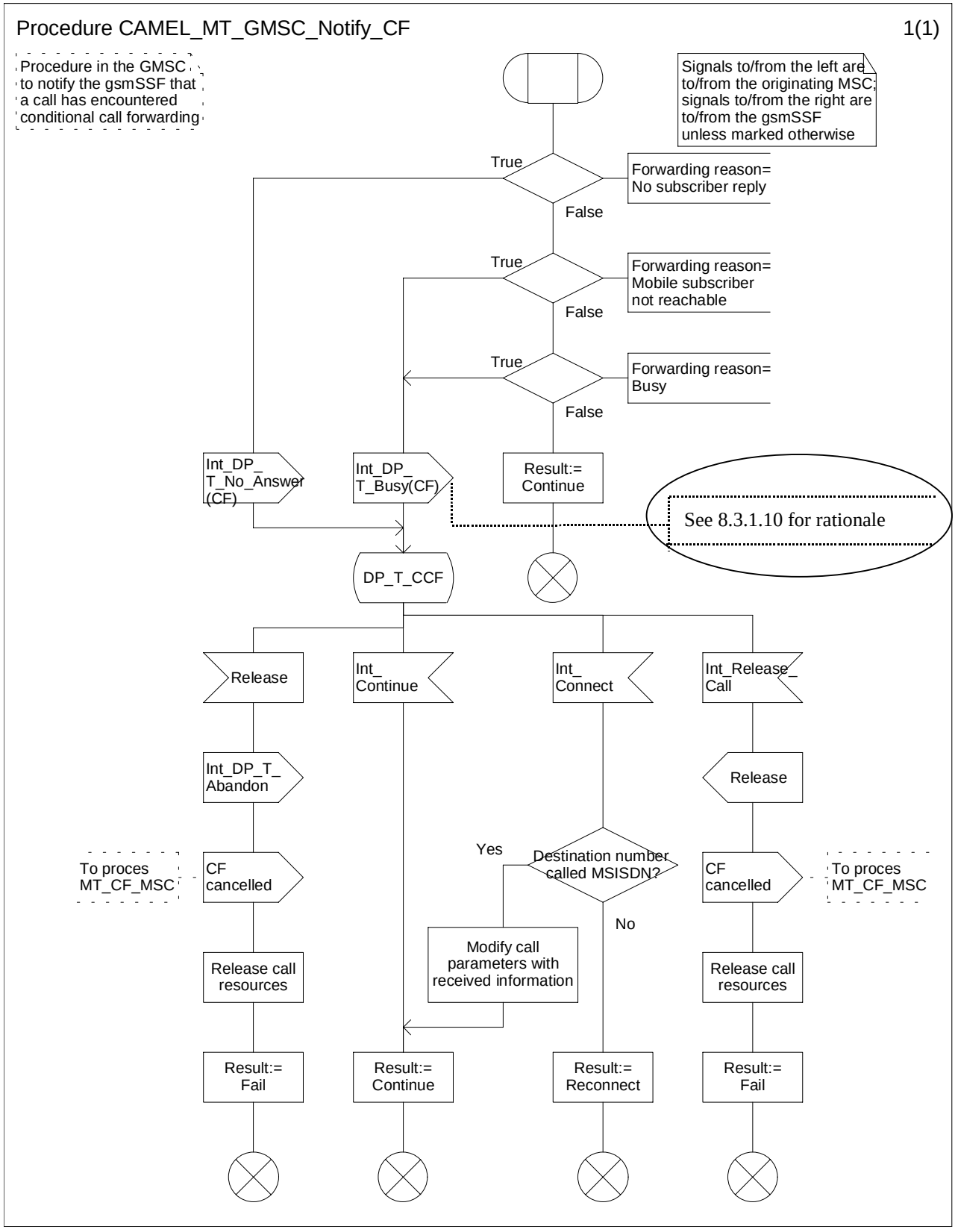

Figure 33a: Procedure CAMEL_MT_GMSC_Notify_CF (sheet 1)

8.3.2 Retrieval of routeing information in the HLR

The functional behaviour of the HLR is specified in 3GPP TS03.18 [3]. The procedures specific to CAMEL are specified in this subclause :

- CAMEL_HLR_INIT;
- CAMEL_CSI_Check_HLR;
- CAMEL_O_CSI_CHECK_HLR;
- CAMEL_T_CSI_CHECK_HLR.

The procedure CAMEL_Provide_Subscriber_Info is specified in subclause 8.8.

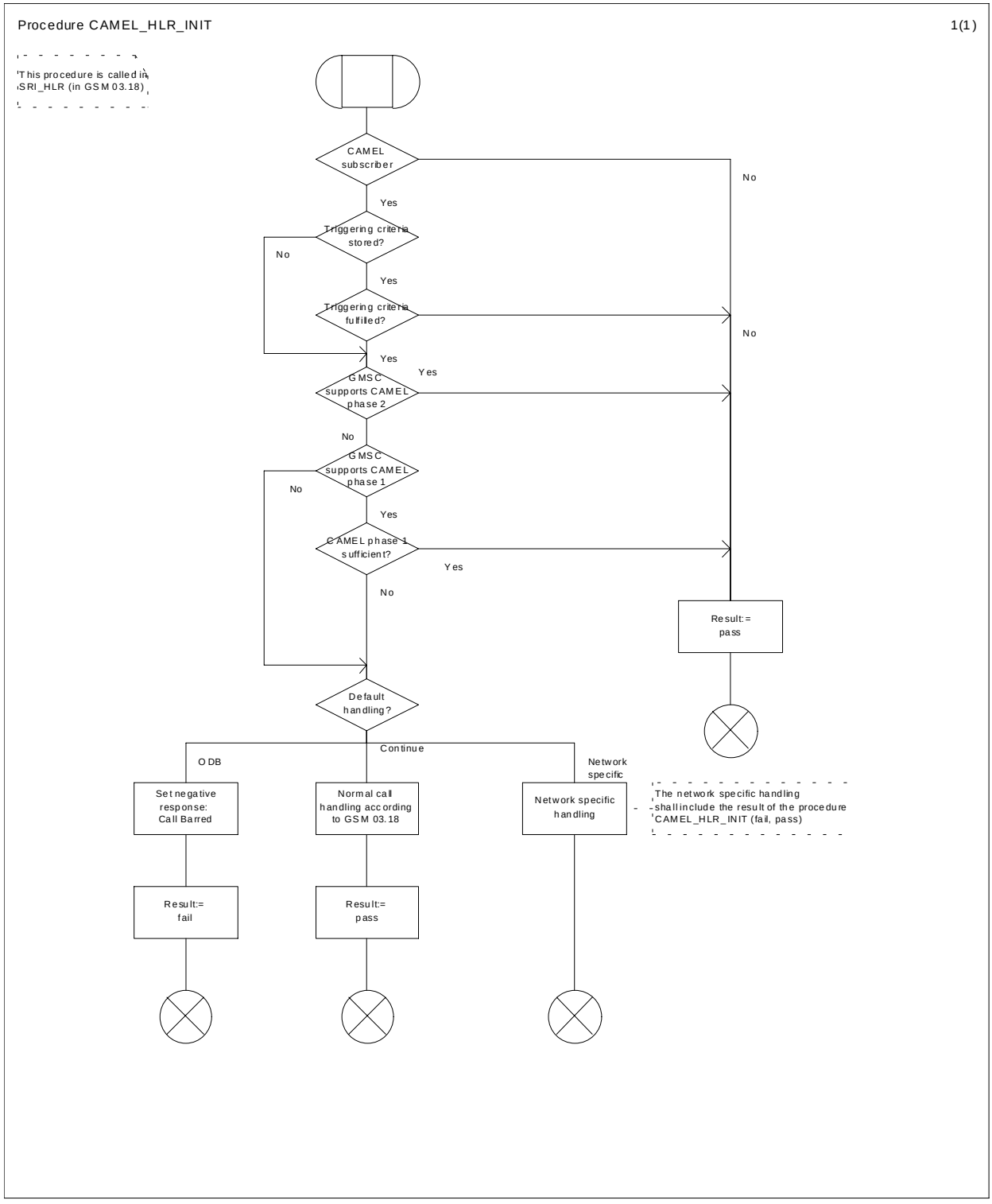

Figure 34a: Procedure CAMEL_HLR_INIT (sheet 1)

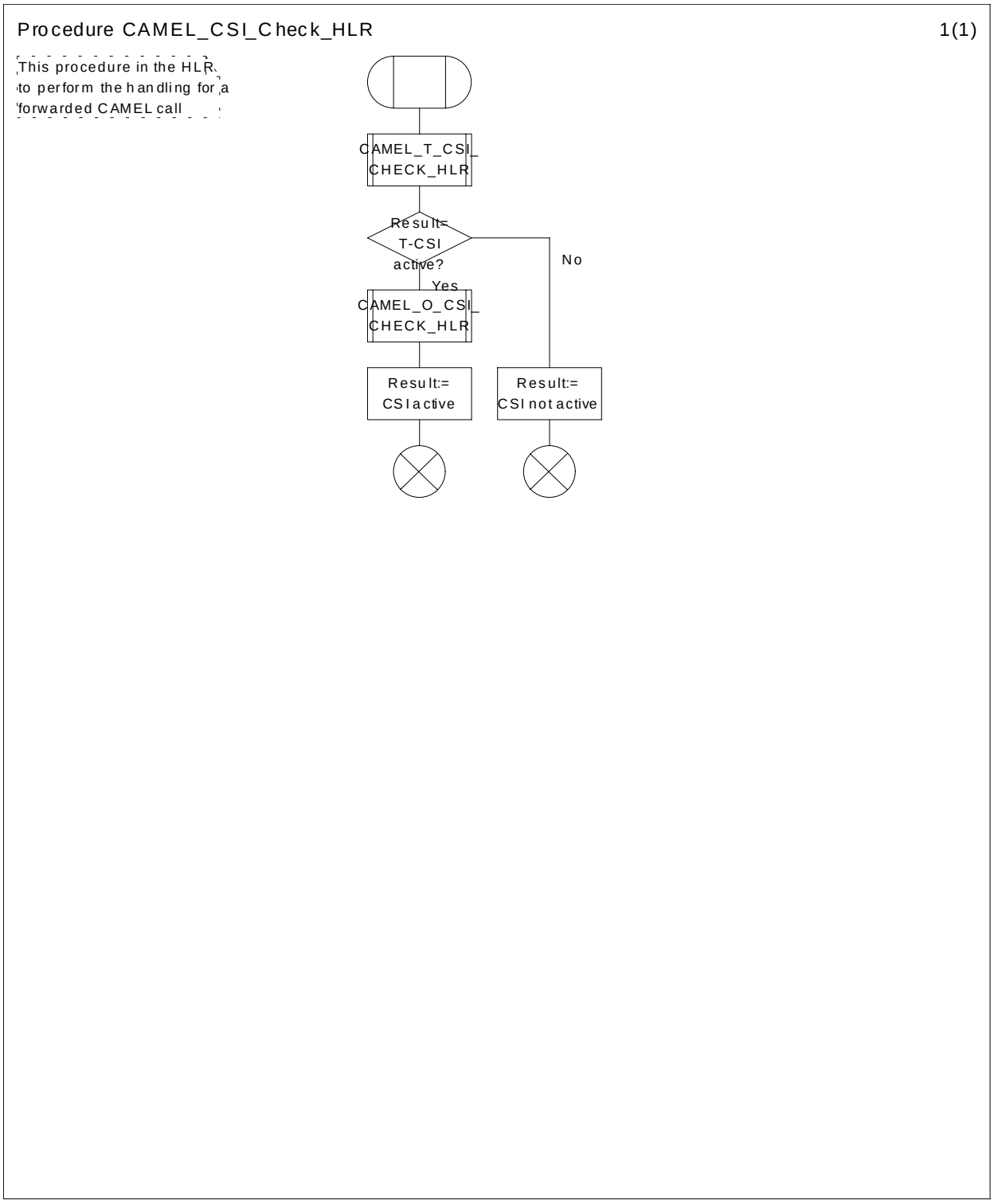

Figure 35a: Procedure CAMEL_CSI_Check_HLR (sheet 1)

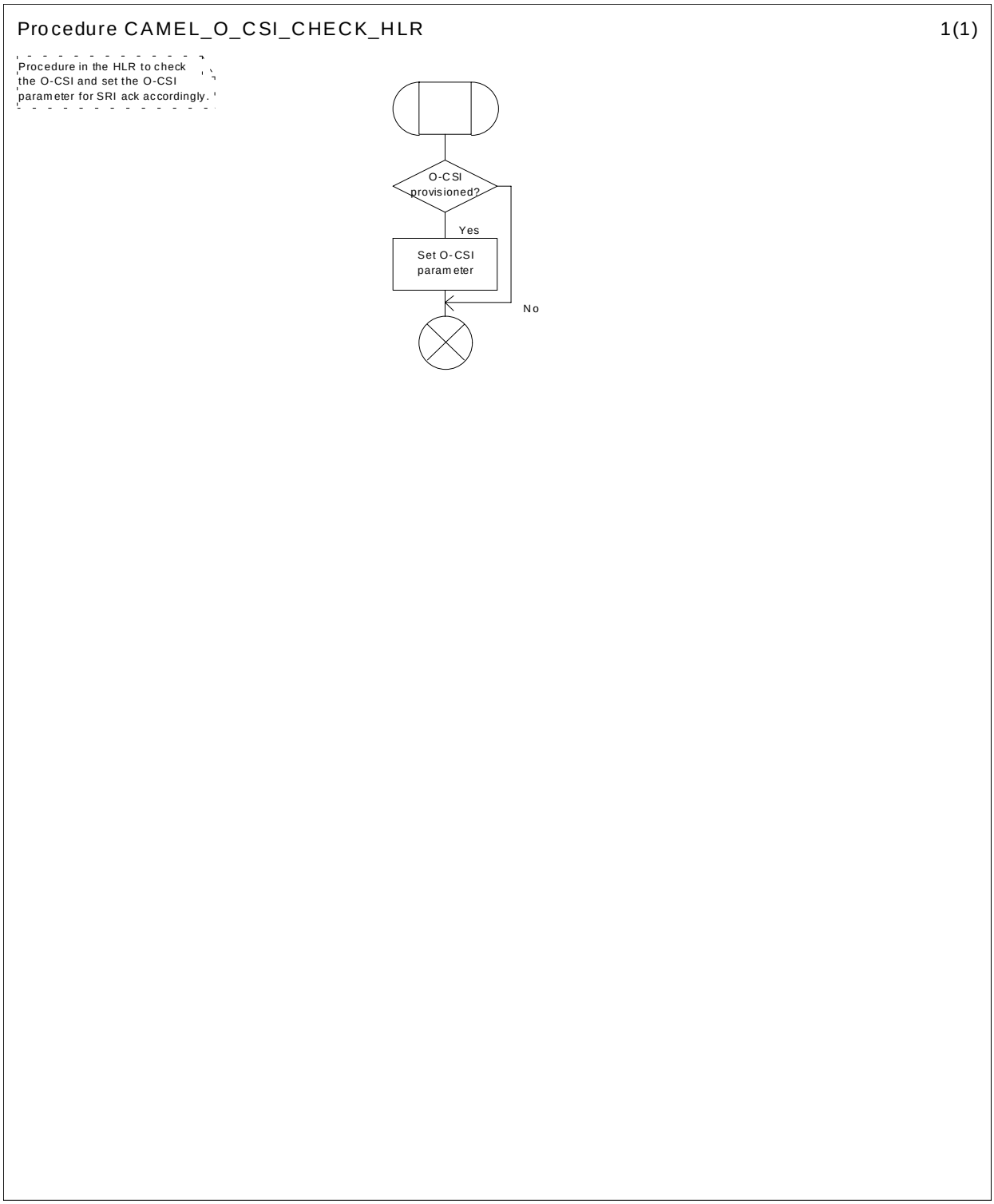

Figure 36a: Procedure CAMEL_O_CSI_CHECK_HLR (sheet 1)

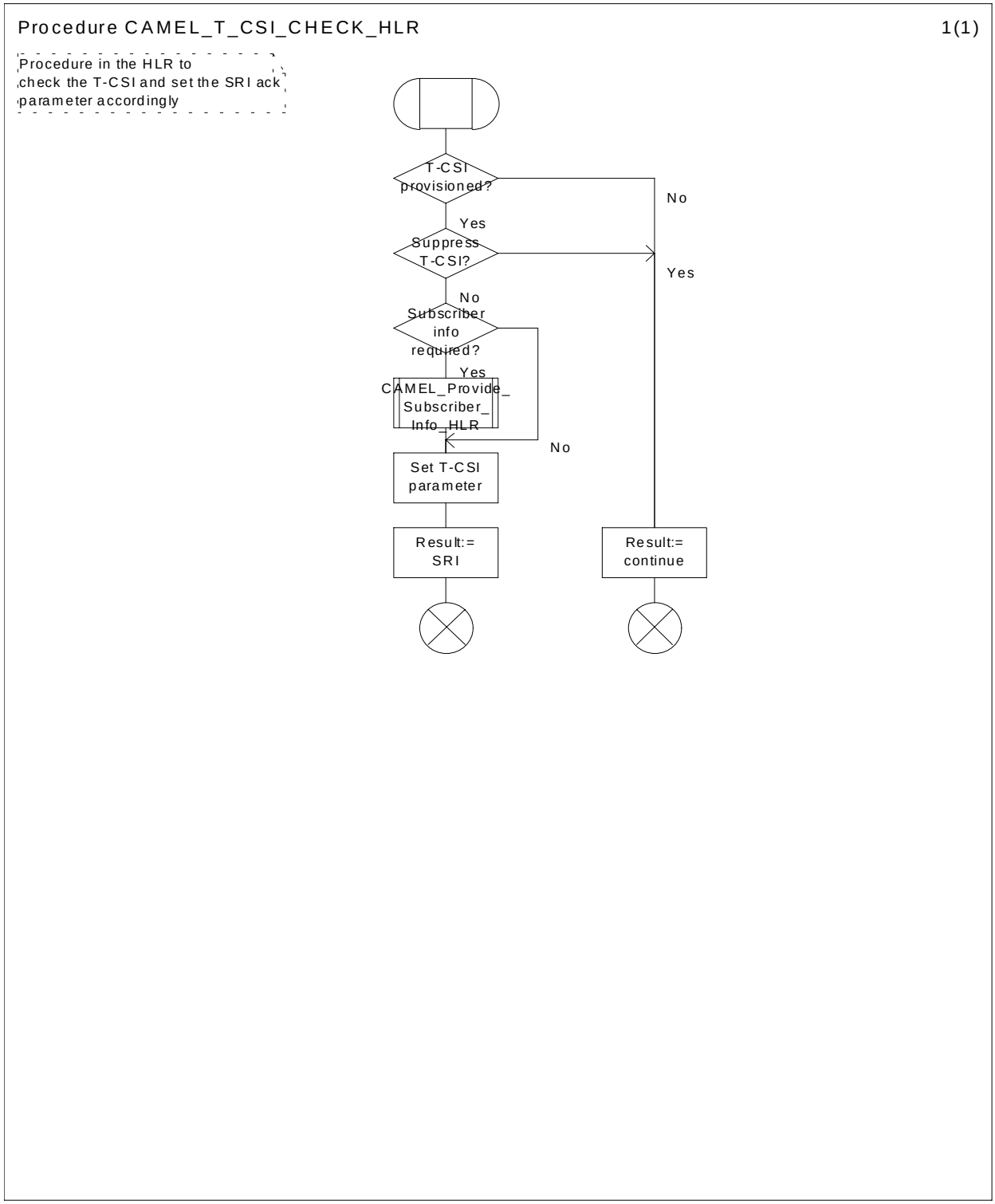

Figure 37a: Procedure CAMEL_T_CSI_CHECK_HLR (sheet 1)

8.3.3 Handling of provide roaming number request in the VLR

The functional behaviour of the VLR is specified in 3GPP TS03.18 [3]. The procedure specific to CAMEL is specified in this subclause :

- CAMEL_SET_SOA.

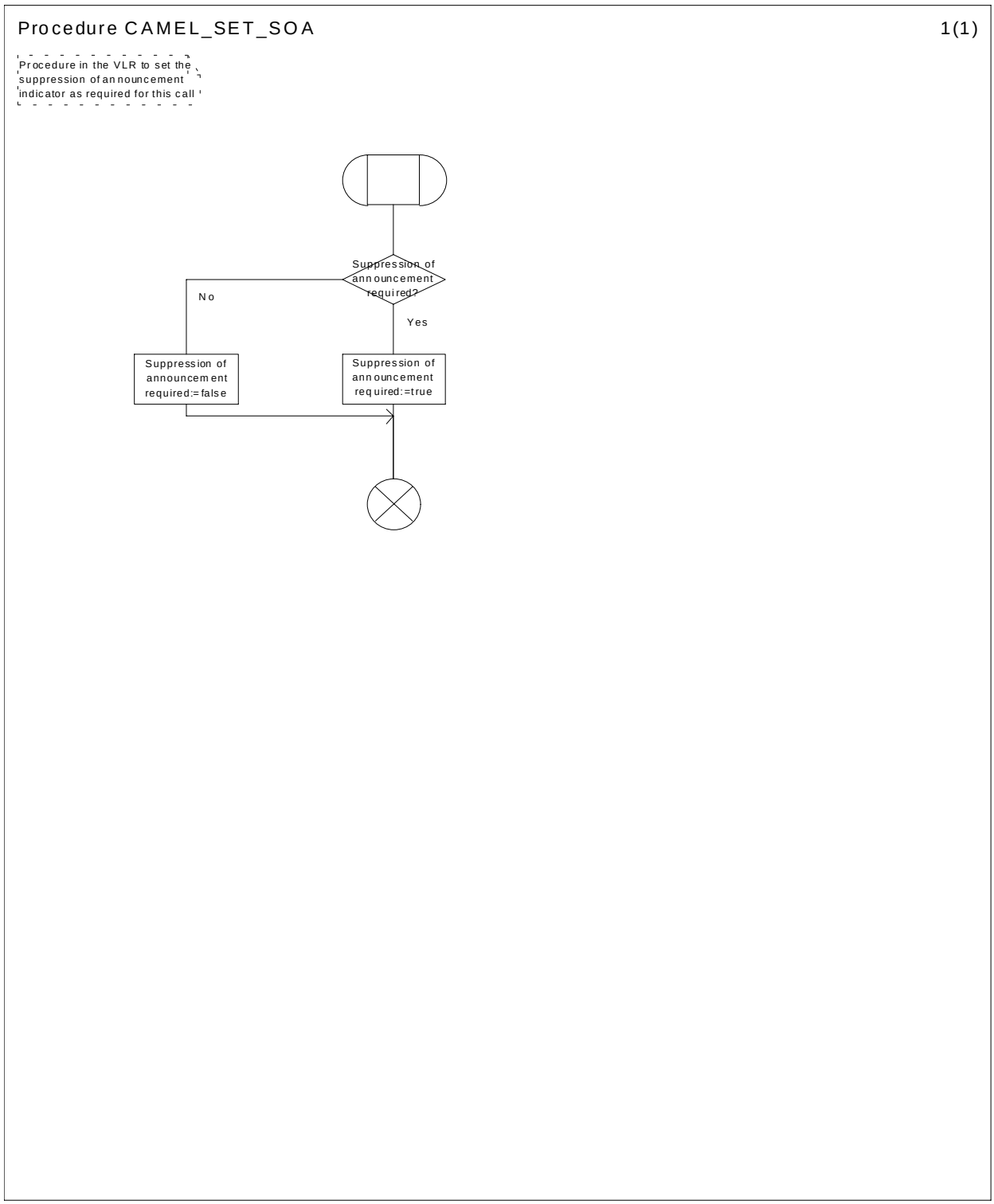

Figure 38a: Procedure CAMEL_SET_SOA (sheet 1)

8.4 Handling of mobile terminating calls

8.4.1 Handling of mobile terminating calls in the terminating VMSC

The functional behaviour of the terminating VMSC is specified in 3GPP TS03.18 [3]. The only behaviour specific to CAMEL is:

- the inclusion of the O-CSI parameter in the Perform Call Forwarding message sent to the process MT_CF_MSC if it was received in the Send Info For Incoming Call ack;

- the requirement to suppress the connection of announcements or tones if the VLR includes the suppression of announcements parameter in the Send Info For Incoming Call negative response.

8.4.2 Handling of mobile terminating calls in the VLR

The functional behaviour of the terminating VLR is specified in 3GPP TS03.18 [3]. The only behaviour specific to CAMEL is:

- the inclusion of the O-CSI parameter in the Send Info For Incoming Call ack if the call is to be forwarded and O-CSI is included in the subscriber data for that subscriber in the VLR;

- the inclusion of the suppression of announcements parameter in the Send Info For Incoming Call negative response if it was received in the Provide Roaming Number.

8.5 Handling of forwarded calls

The handling of forwarded calls in the GMSC or the terminating VMSC is specified in 3GPP TS03.18 [3]. The procedures specific to CAMEL are specified in this subclause.

- Procedure CAMEL_CF_MSC_INIT,

- Procedure CAMEL_CF_MSC_ANSWER

- Procedure CAMEL_CF_ETC,

- Procedure CAMEL_CF_CTR,

- Procedure CAMEL_Check_ORLCF_VMSC.

A mobile terminated call can be forwarded either in the GMSC (indicated by provision of Forwarded-To-Number from HLR or gsmSCF) or in the MSC (indicated by provisioning of Forwarded-To-Number from VLR).

8.5.1 Procedure CAMEL_CF_MSC_INIT: handling of Int_Connect

The received parameters are used to overwrite the corresponding ISUP parameters (for mapping see 3GPP TS 09.78 [5]. Call parameters which are not included in the Int_Connect message are unchanged.

An a network operator option, loop prevention mechanisms may cause the redirection information to be ignored or modified (e.g., if the Redirection counter has been decreased).

Signalling limitations or regulatory requirements may require the Calling Partys Category, Generic Number, Original Called Party Number and Redirecting Party ID to be ignored or modified.

The network signalling system shall indicate that this is an internal network number.

8.5.2 Action of the GMSC in procedure CAMEL_CF_ETC

In procedure CAMEL_CF_ETC (sheet 2) the GMSC or terminating VMSC will remain in the Wait_For_Assiting_Answer state until it receives an ISUP Answer Message (ANM) or timeout occurs. This is to ensure that a call record is always generated for every successful establishment of a temporary connection to a gsmSRF, especially in the case where the connection is between PLMNs.

NOTE: This means that it may not be possible to access an SRF which does not generate an ISUP Answer Message (ANM).

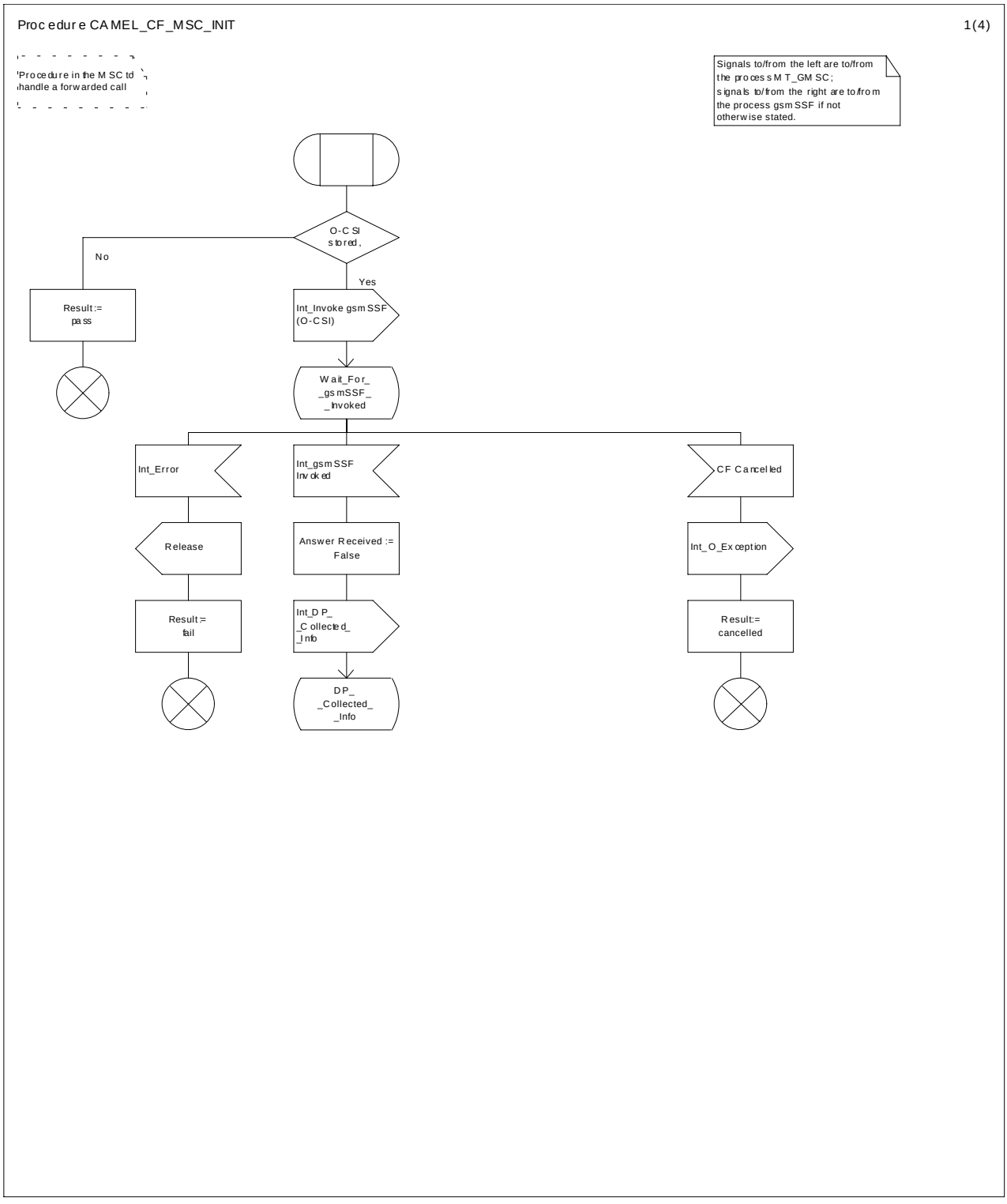

Figure 39a: Procedure CAMEL_CF_MSC_INIT (sheet 1)

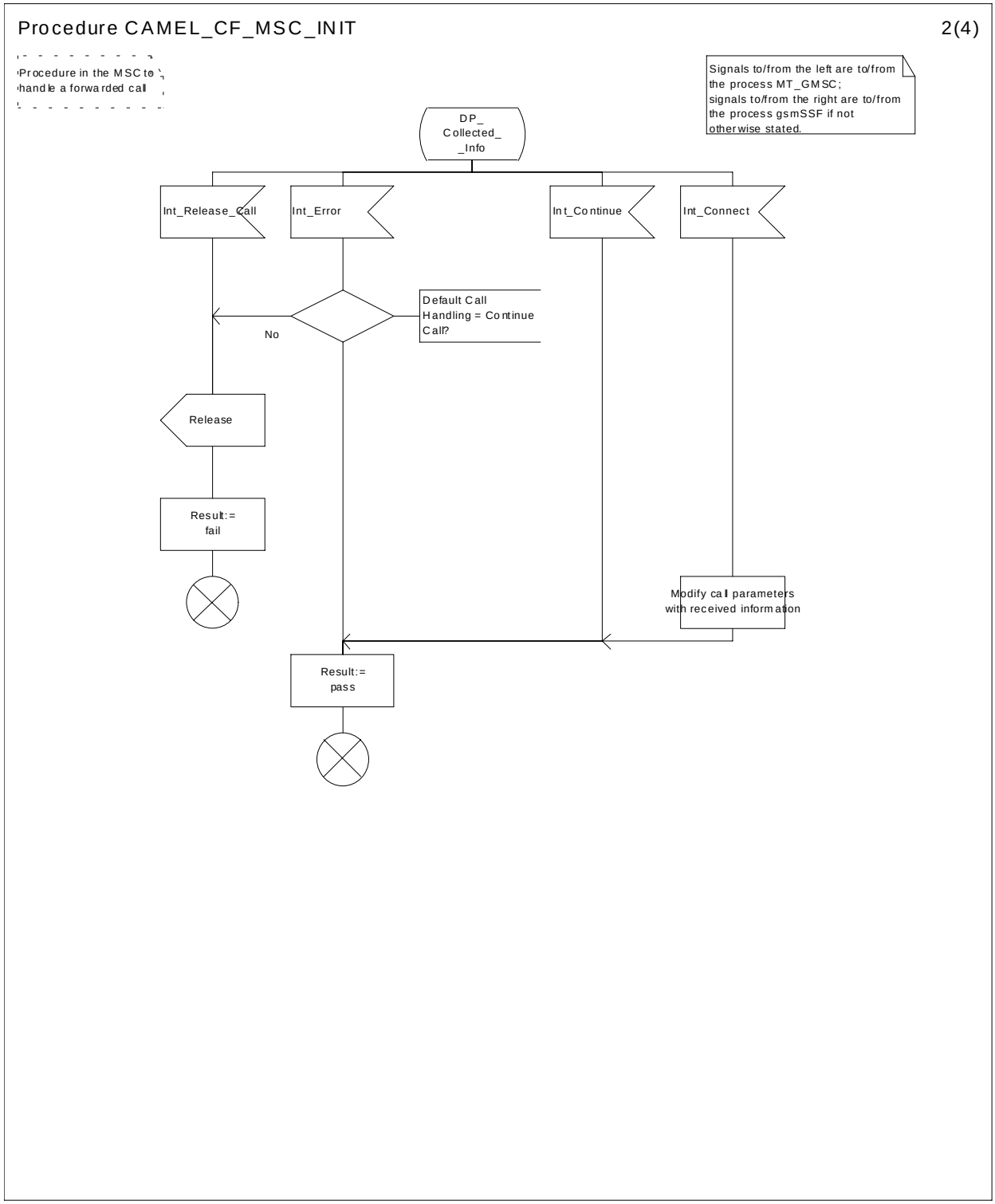

Figure 39b: Procedure CAMEL_CF_MSC_INIT (sheet 2)

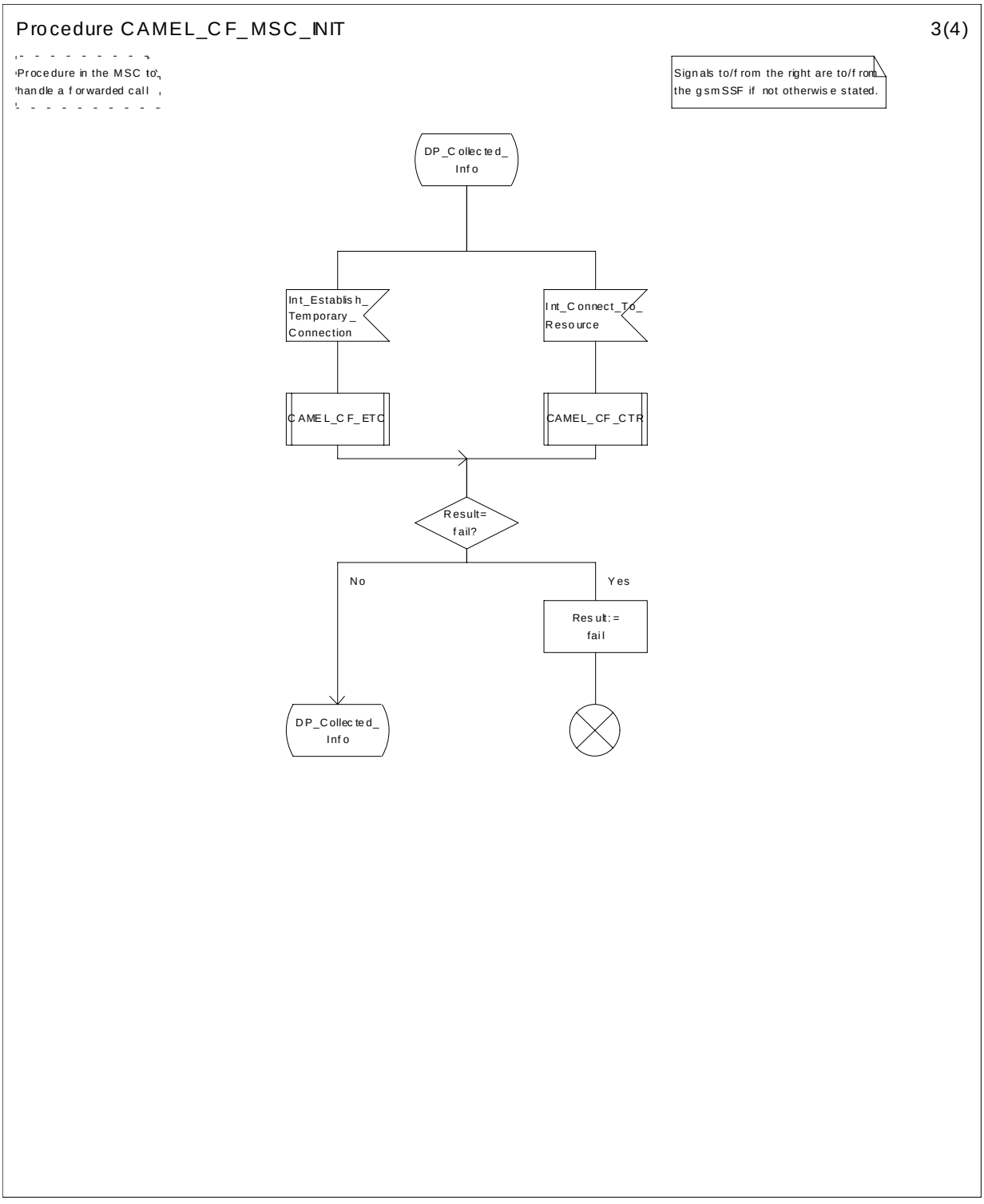

Figure 39c: Procedure CAMEL_CF_MSC_INIT (sheet 3)

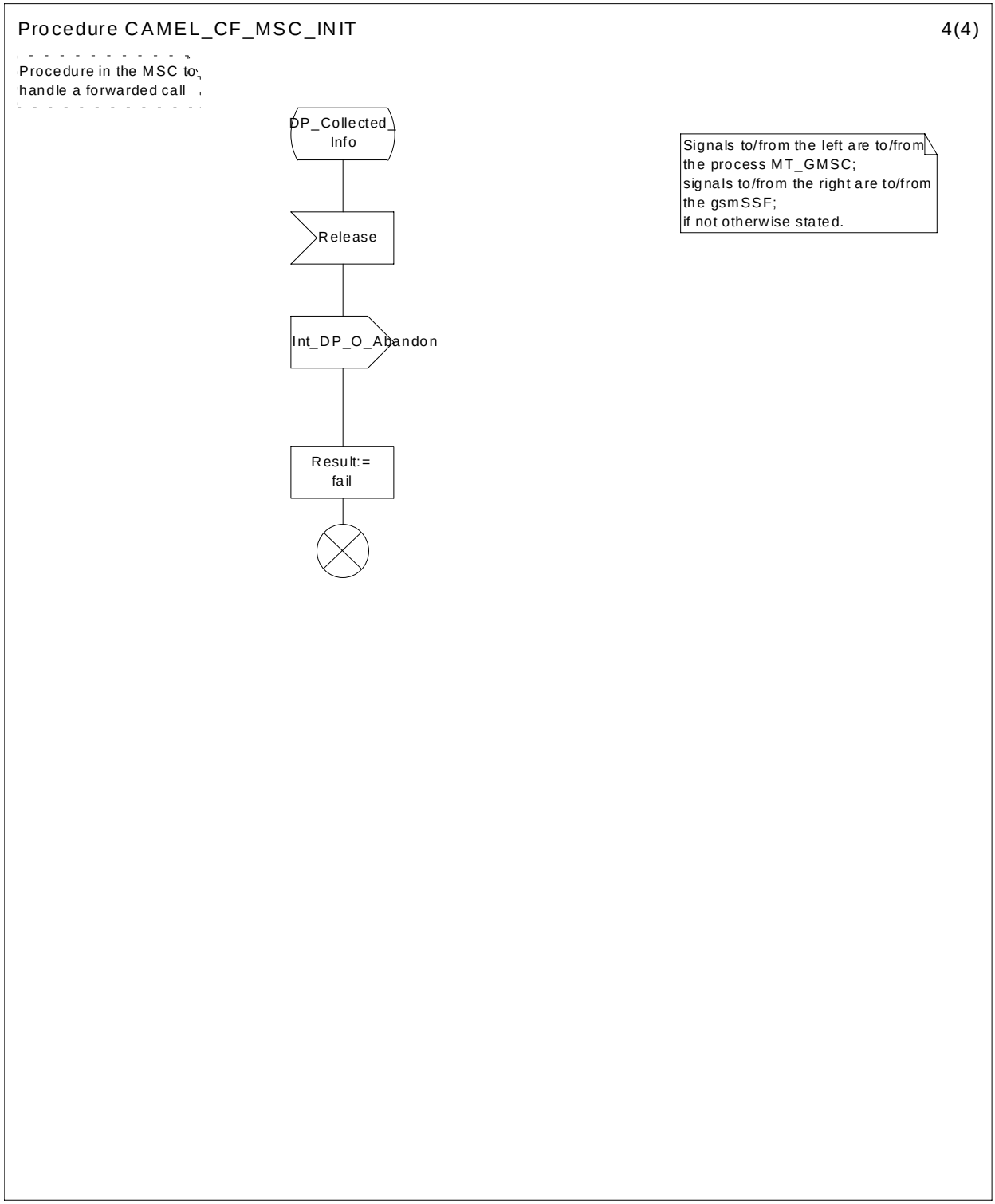

Figure 39d: Procedure CAMEL_CF_MSC_INIT (sheet 4)

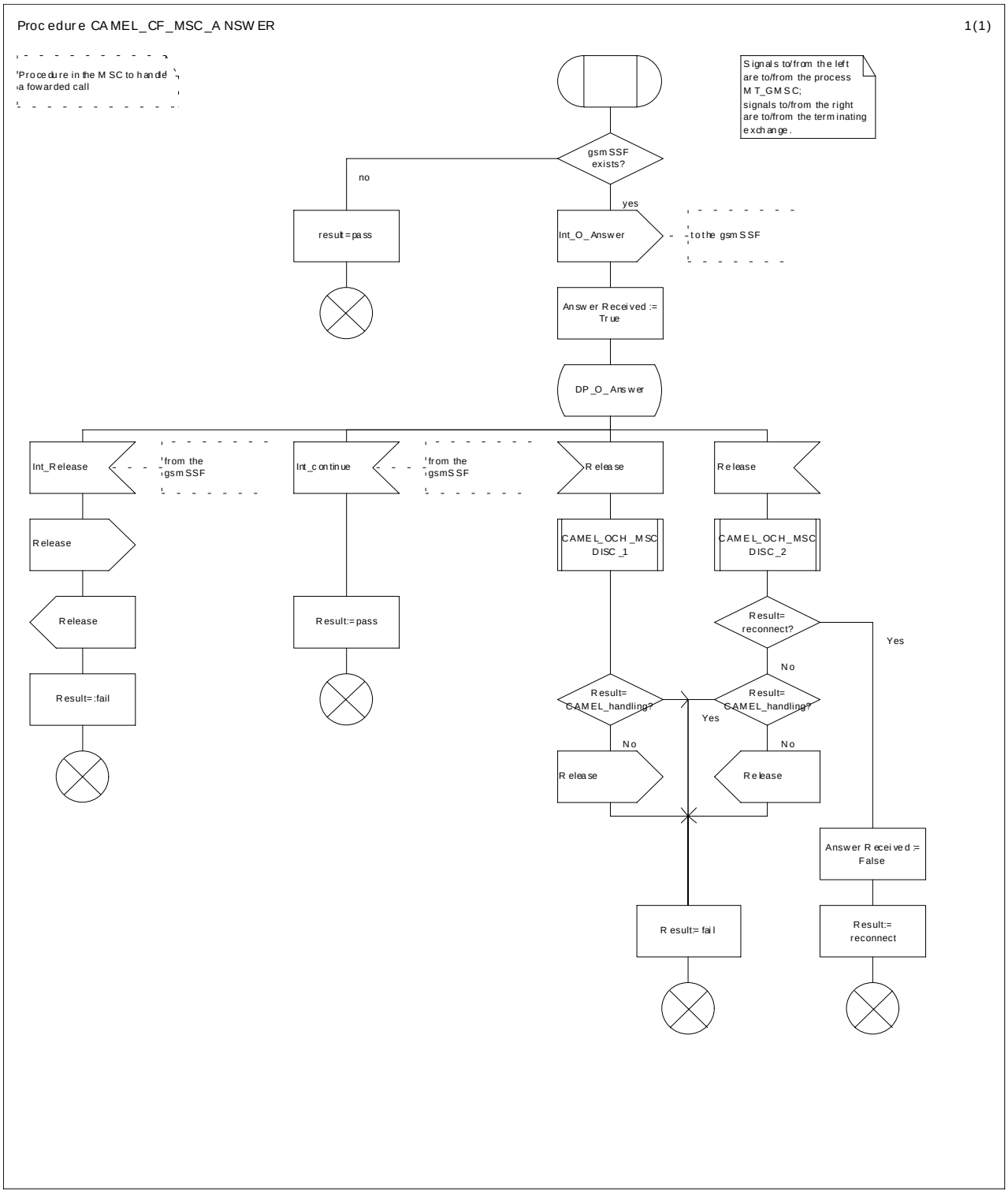

Figure 40a: Procedure CAMEL_CF_MSC_ANSWER (sheet 1)

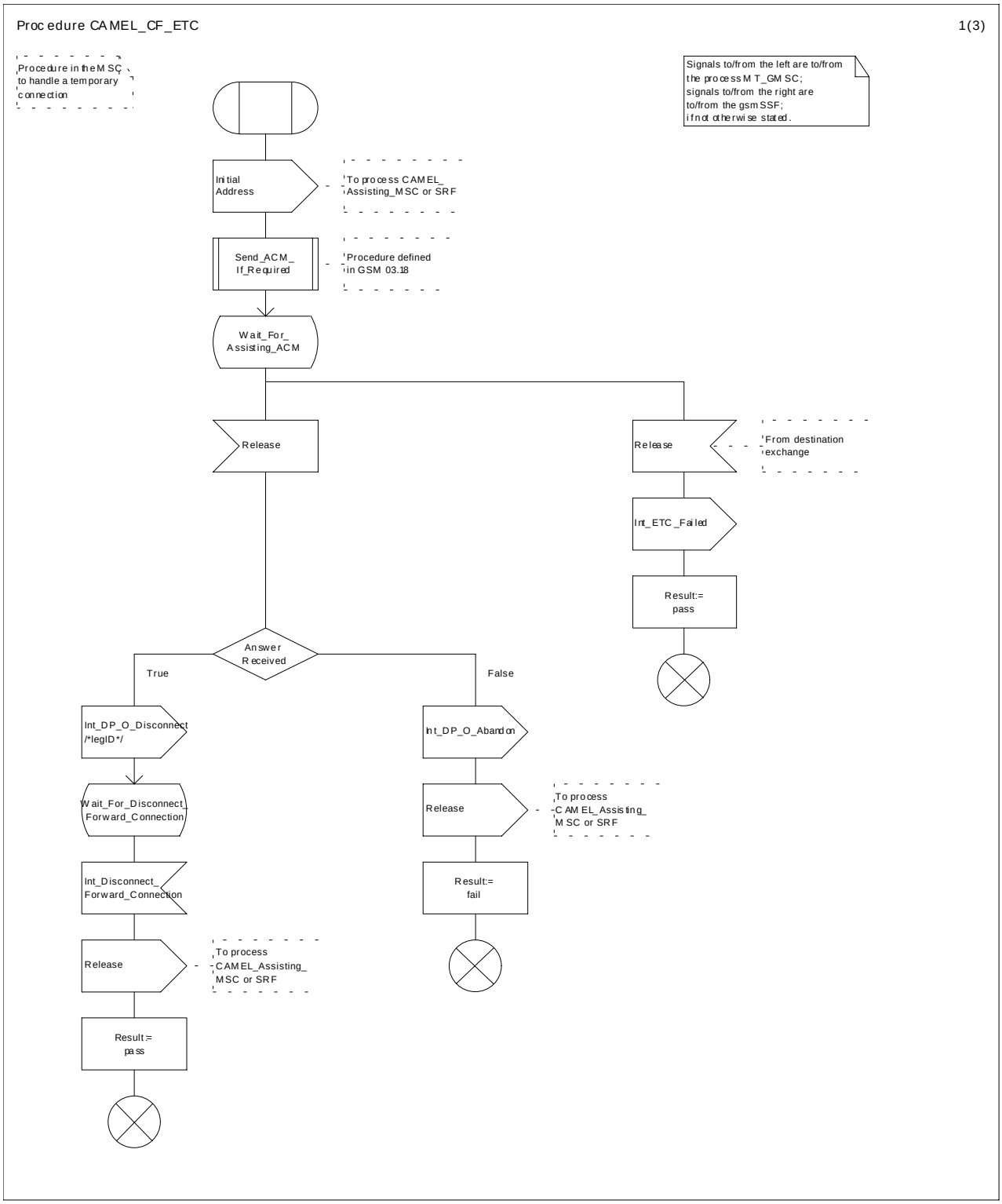

Figure 41a: Process CAMEL_CF_ETC (sheet 1)

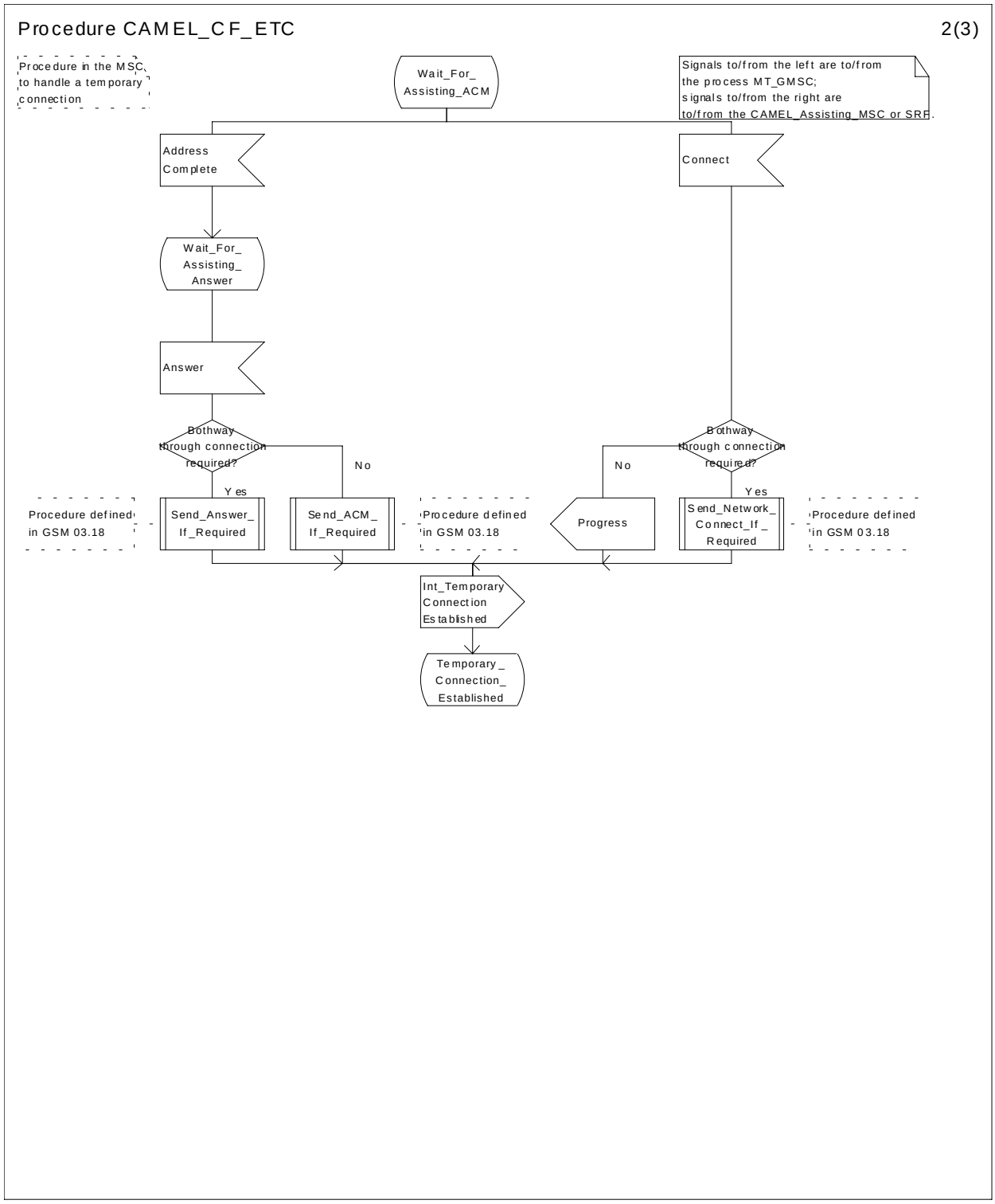

Figure 41b: Procedure CAMEL_CF_ETC (sheet 2)

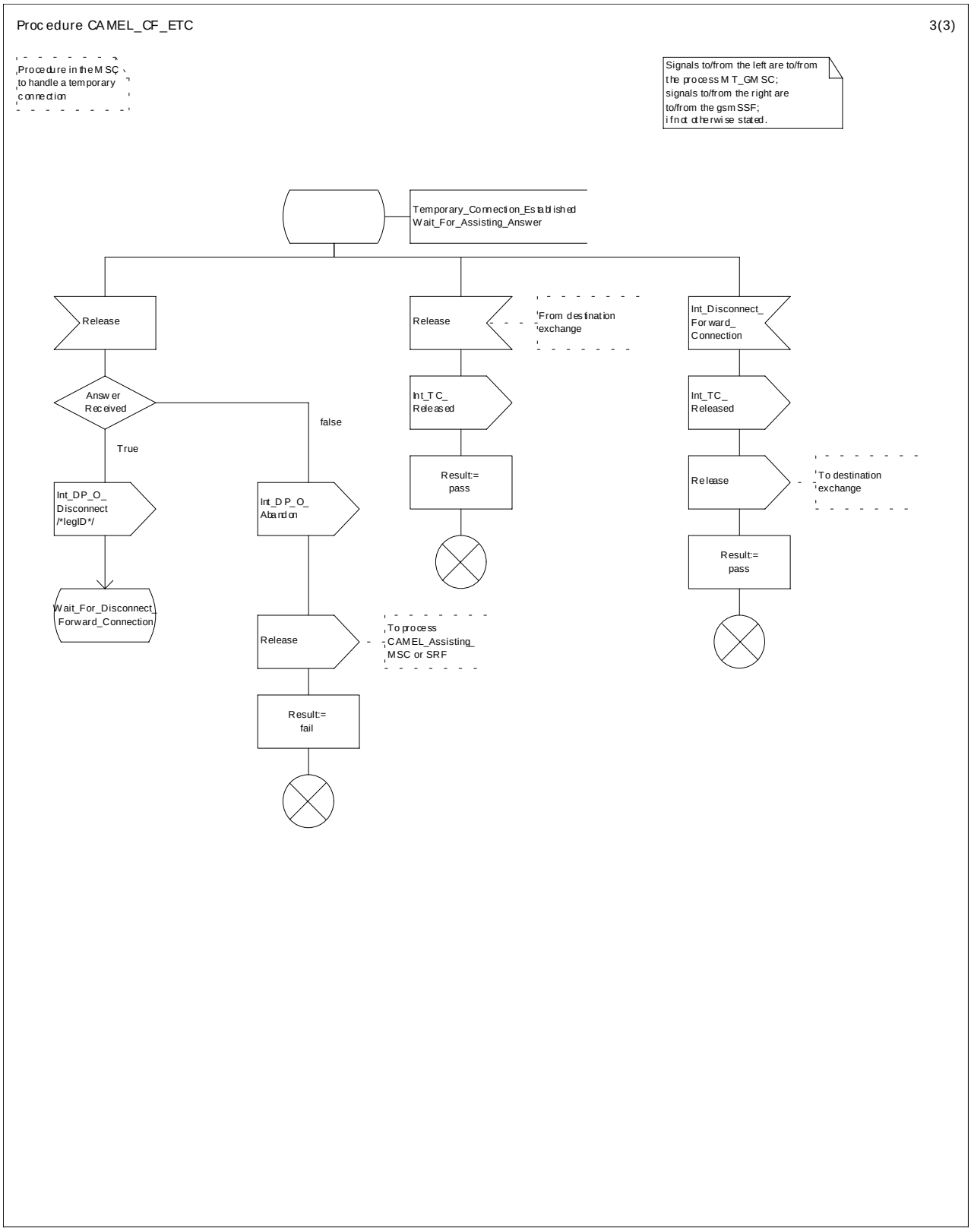

Figure 41c: Procedure CAMEL_CF_ETC (sheet 3)

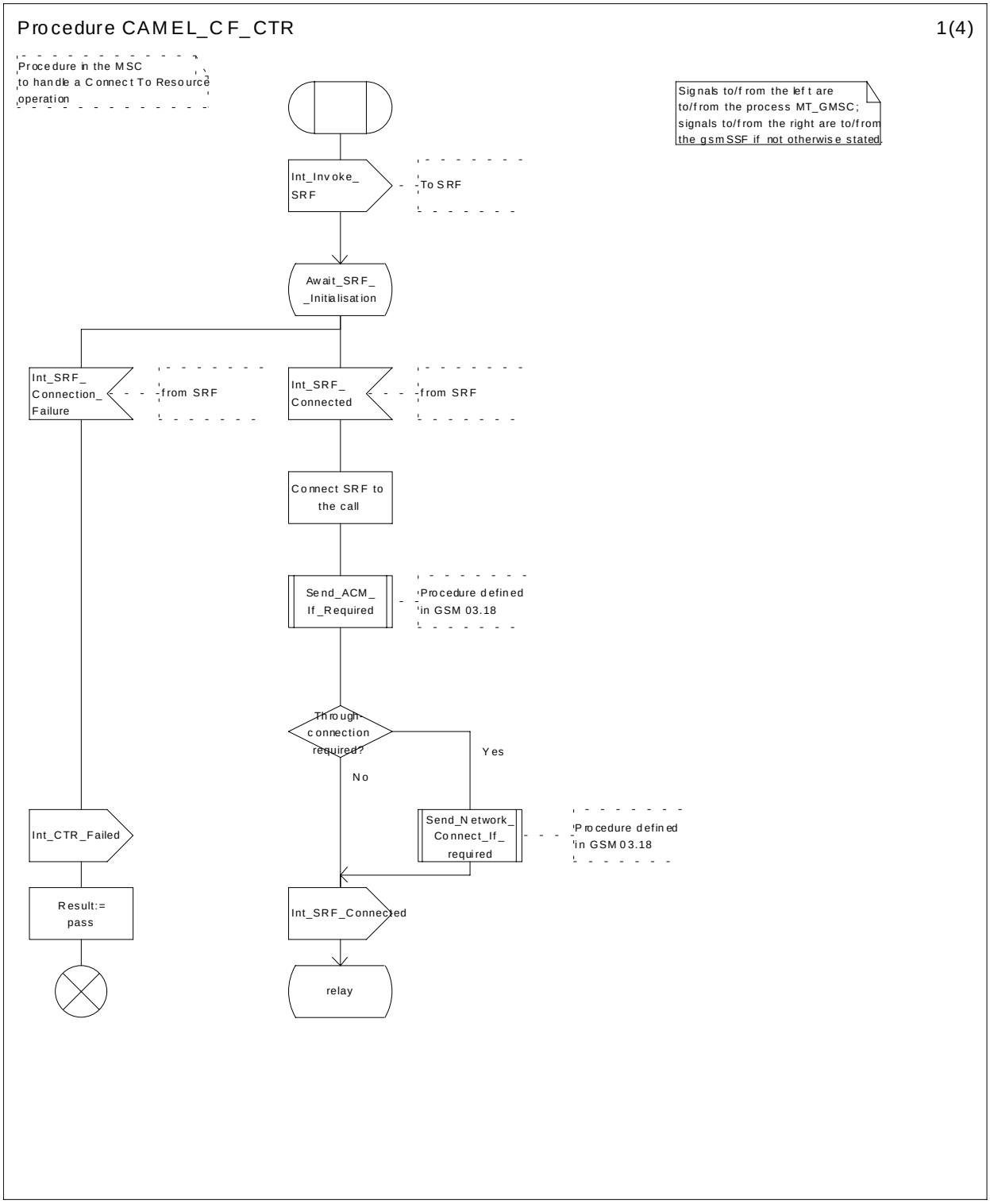

Figure 42a: Process CAMEL_CF_CTR (sheet 1)

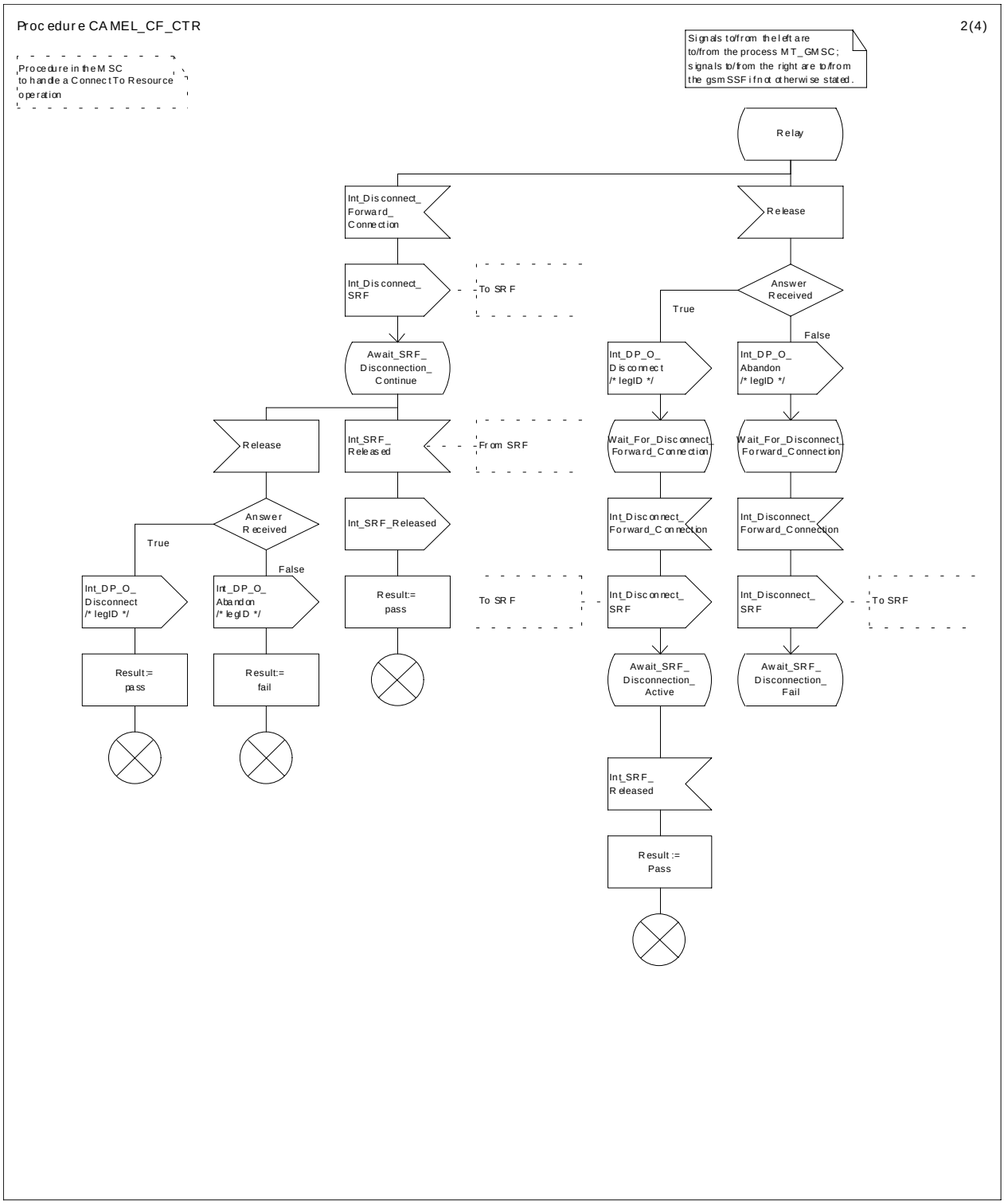

Figure 42b: Procedure CAMEL_CF_CTR (sheet 2)

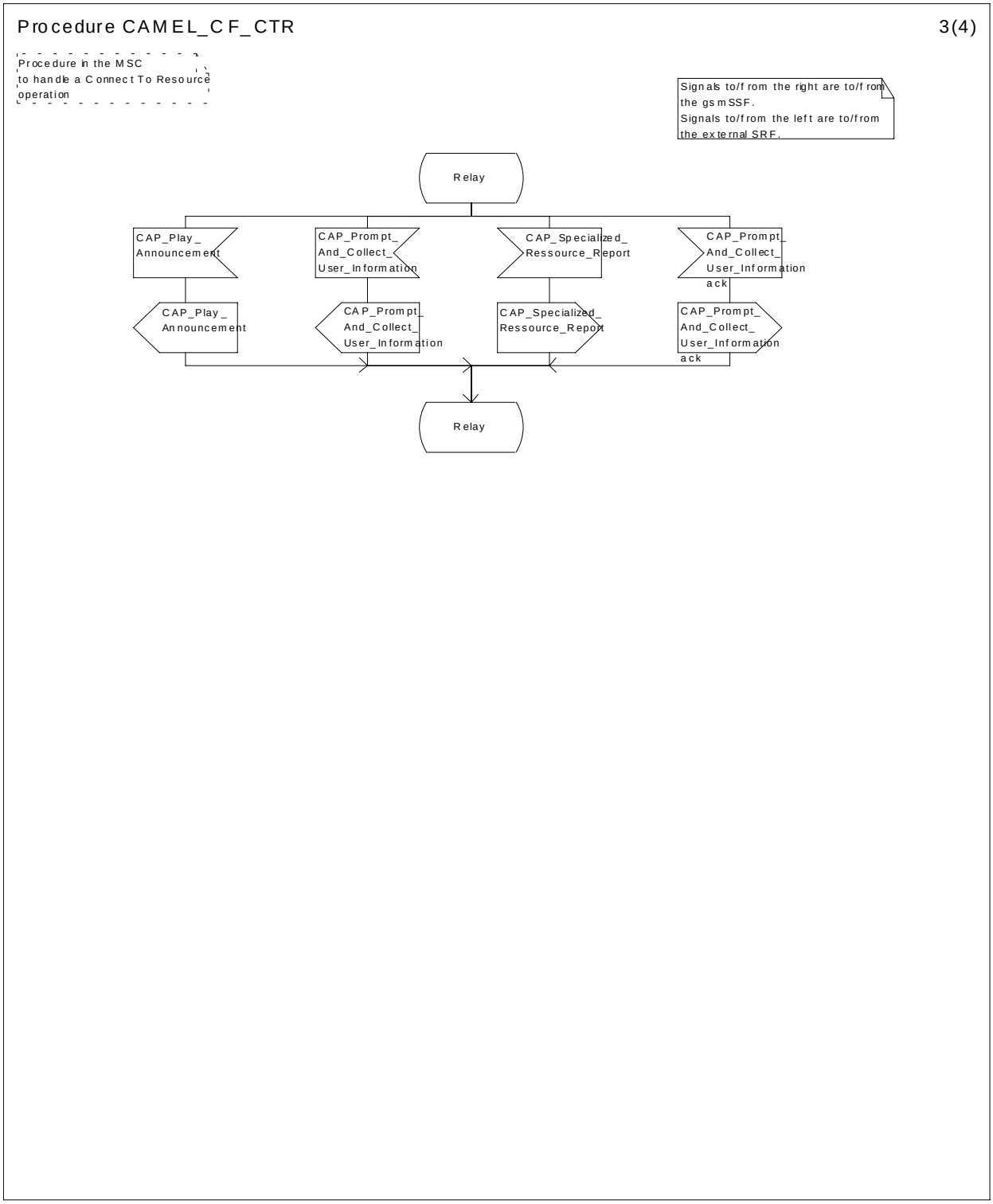

Figure 42c: Procedure CAMEL_CF_CTR (sheet 3)

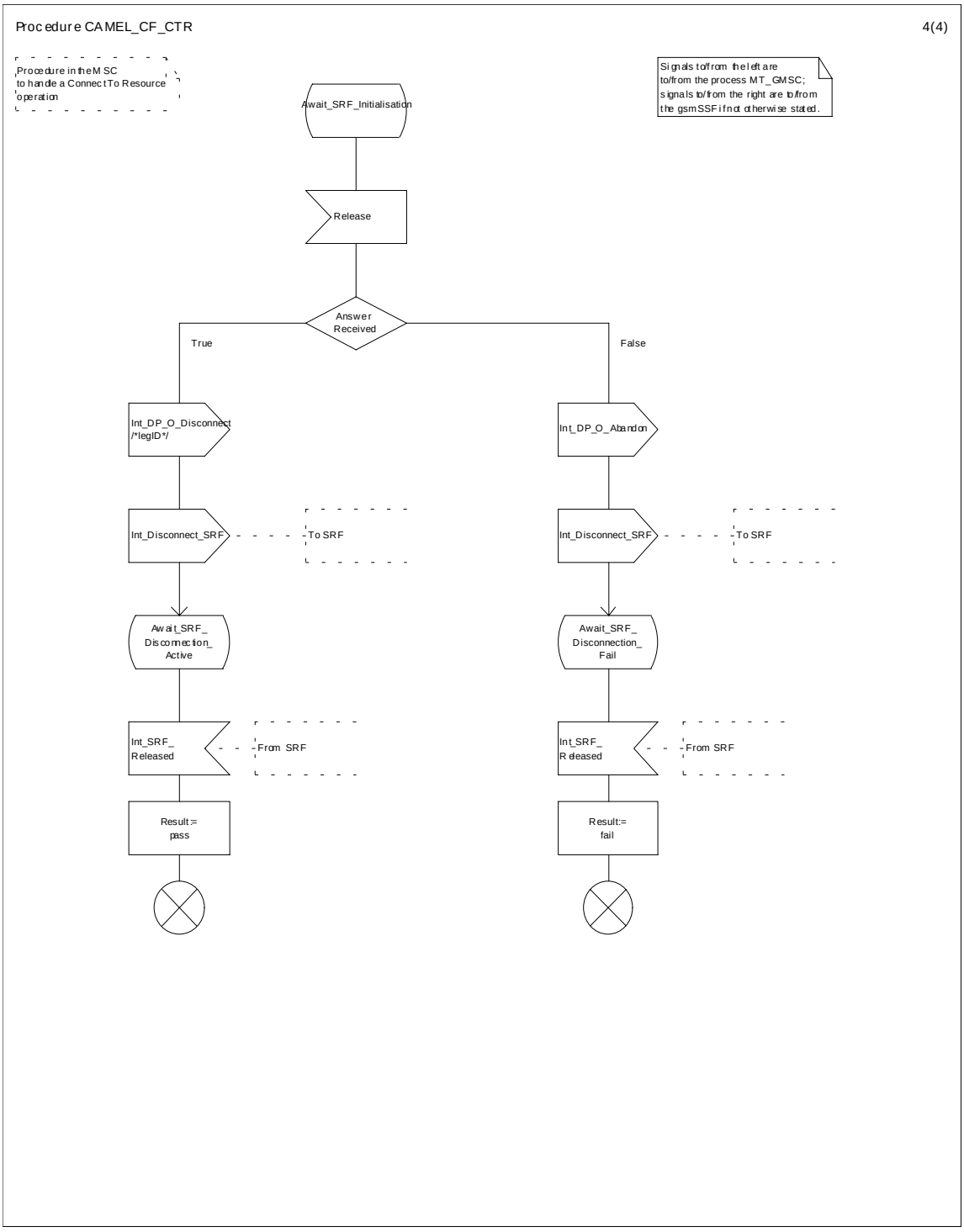

Figure 42d: Procedure CAMEL_CF_CTR (sheet 4)

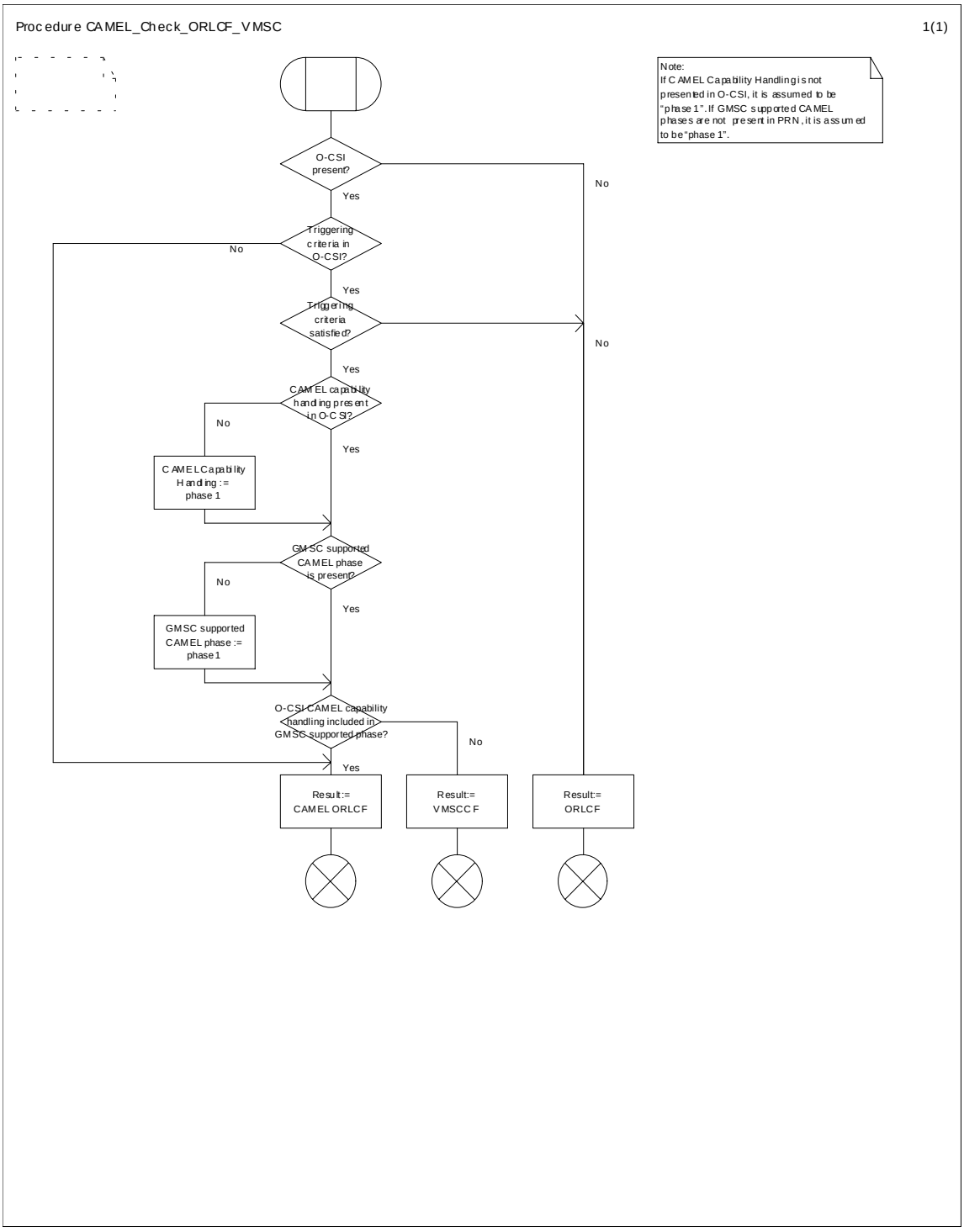

Figure 43a: Procedure CAMEL_Check_ORLCF_VMSC (sheet 1)

8.6 Handling of mobile calls in the gsmSSF

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

- gsmSSF,
- Check_Criteria.
- Handle_AC,
- Handle_ACR,
- Handle_CIR,
- Handle_CIR_leg,
- Complete_FCI_record,
- Complete_all_FCI_records,- Handle_SCI.

The detailed error handling for the process gsmSSF and the associated procedures is specified in 3GPP TS 09.78 ([5]).

8.6.1 Information flow for call duration control

The following diagram shows the handling of the different timers that are used in the process gsmSSF and in the procedures Handle_AC, Handle_ACR, Handle_CIR. Timers Tssf, Tcp, Tsw, Tw and DELTA are defined in the process gsmSSF.

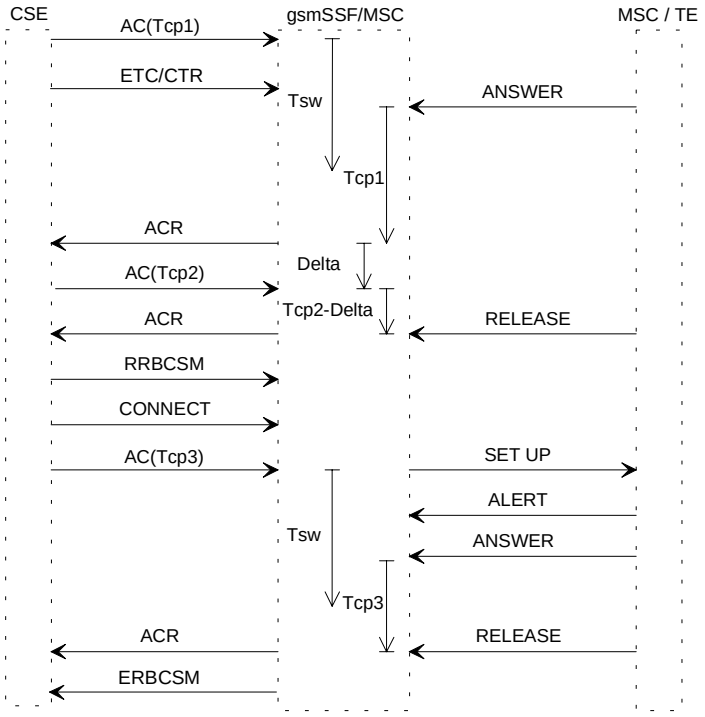

Figure 44: Information flow for call control duration

8.6.2 Behaviour of the gsmSSF in the process gsmSSF

The following paragraphs give details on the behaviour of the gsmSSF in the process gsmSSF.

8.6.2.1 Actions of the gsmSSF on receipt of CAP_Request_Report_BCSM_Event (at the state Waiting_For_Instructions)

The gsmSSF arms the requested EDP, if the arming rules are fulfilled and returns to state Waiting_For_Instructions.

The gsmSCF may request the monitoring for any one or more Answer, Busy, No Answer, Abandon, Route Select Failure and Disconnect Event of a party in the call.

8.6.2.2 Actions of the gsmSSF on receipt of CAP_Continue (at the state Waiting_For_Instructions)

An Int_Continue is sent to request the GMSC/MSC to continue call set-up as originally requested.

8.6.2.3 Actions of the gsmSSF on receipt of CAP_Release_Call (at the state Monitoring)

When a control relationship exists between the gsmSCF and gsmSSF (at least one EDP-R is armed), the gsmSCF may spontaneously instruct the gsmSSF to release the call at any time using the Release Call IF. The Release Call IF shall not be sent from the gsmSCF if only monitor relationship exists between the gsmSSF and the gsmSCF.

8.6.2.4 Actions of the gsmSSF on receipt of Int_DP_T_Busy or Int_DP_T_No_Answer including the parameter CF (at the state Monitoring)

If the handling of Int_DP_T_Busy or Int_DP_T_No_Answer including the parameter CF leads to the gsmSSF sending a CAP_Event_Report_BCSM to the gsmSCF, the gsmSSF shall include the parameter Call Forwarded as the Event Specific Information BCSM.

8.6.3 Procedure Handle_SCI

1) Precondition: before an answer event is detected and no Tsw running:

   if 1 set of e-parameters received --> send to the MSC

   if 2 sets e-parameters received --> error

   if 1 set of e-parameters and Tariff Switch received --> error

   if 2 sets of e-parameters and Tariff Switch received --> send 1st/start Tsw/store 2nd

2) Precondition: before an answer event is detected and Tsw running and no e-parameters

   if 1 set of e-parameters received --> error, no e-parameters stored

   if 2 sets e-parameters received --> send 1st/store 2nd

   if 1 set of e-parameters and Tariff Switch received --> error

   if 2 sets of e-parameters and Tariff Switch received --> error

3) Precondition: before an answer event is detected and Tsw running and e-parameters stored:

   if 1 set of e-parameters received --> error

   if 2 sets e-parameters received --> error

   if 1 set of e-parameters and Tariff Switch received --> error

   if 2 sets of e-parameters and Tariff Switch received --> error

4) Precondition: after an answer event is detected and no Tsw running:

   if 1 set of e-parameters received --> send to the MSC

   if 2 sets e-parameters received --> error

   if 1 set of e-parameters and Tariff Switch received --> start Tsw/store set

   if 2 sets of e-parameters and Tariff Switch received --> error

5) Precondition: after an answer event is detected and Tsw running and no e-parameters

   if 1 set of e-parameters received --> store e-parameters

   if 2 sets e-parameters received --> error

   if 1 set of e-parameters and Tariff Switch received --> error

   if 2 sets of e-parameters and Tariff Switch received --> error

6) Precondition: after an answer event is detected and Tsw running and e-parameters stored:

   if 1 set of e-parameters received --> error

   if 2 sets e-parameters received --> error

   if 1 set of e-parameters and Tariff Switch received --> error

   if 2 sets of e-parameters and Tariff Switch received --> error

NOTE: The MSC shall store the received e-parameters to be sent subsequently to the MS. The MSC shall send these e parameters to the MS in a Connect message or in a Facility message.

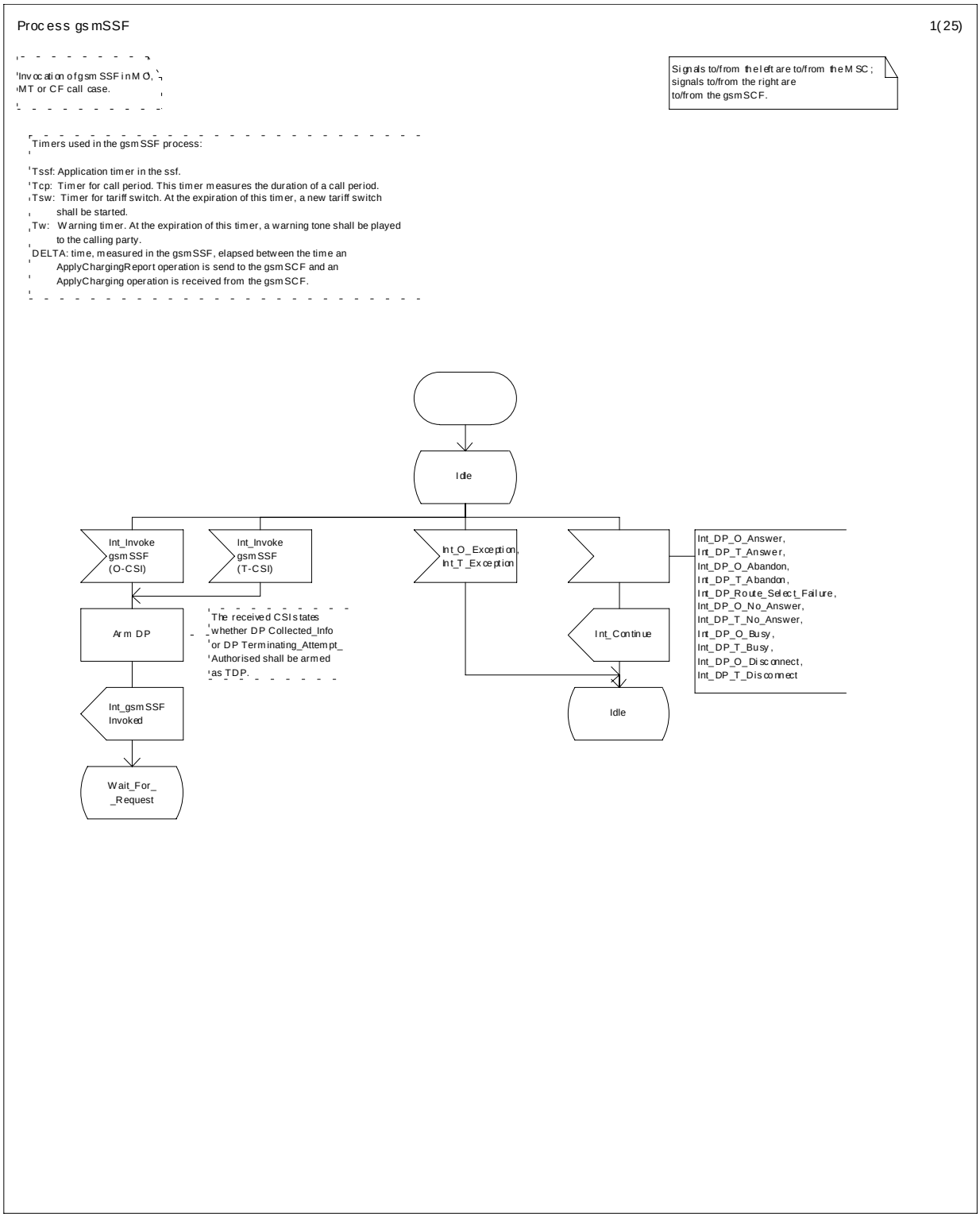

Figure 45a: Process gsmSSF (sheet 1)

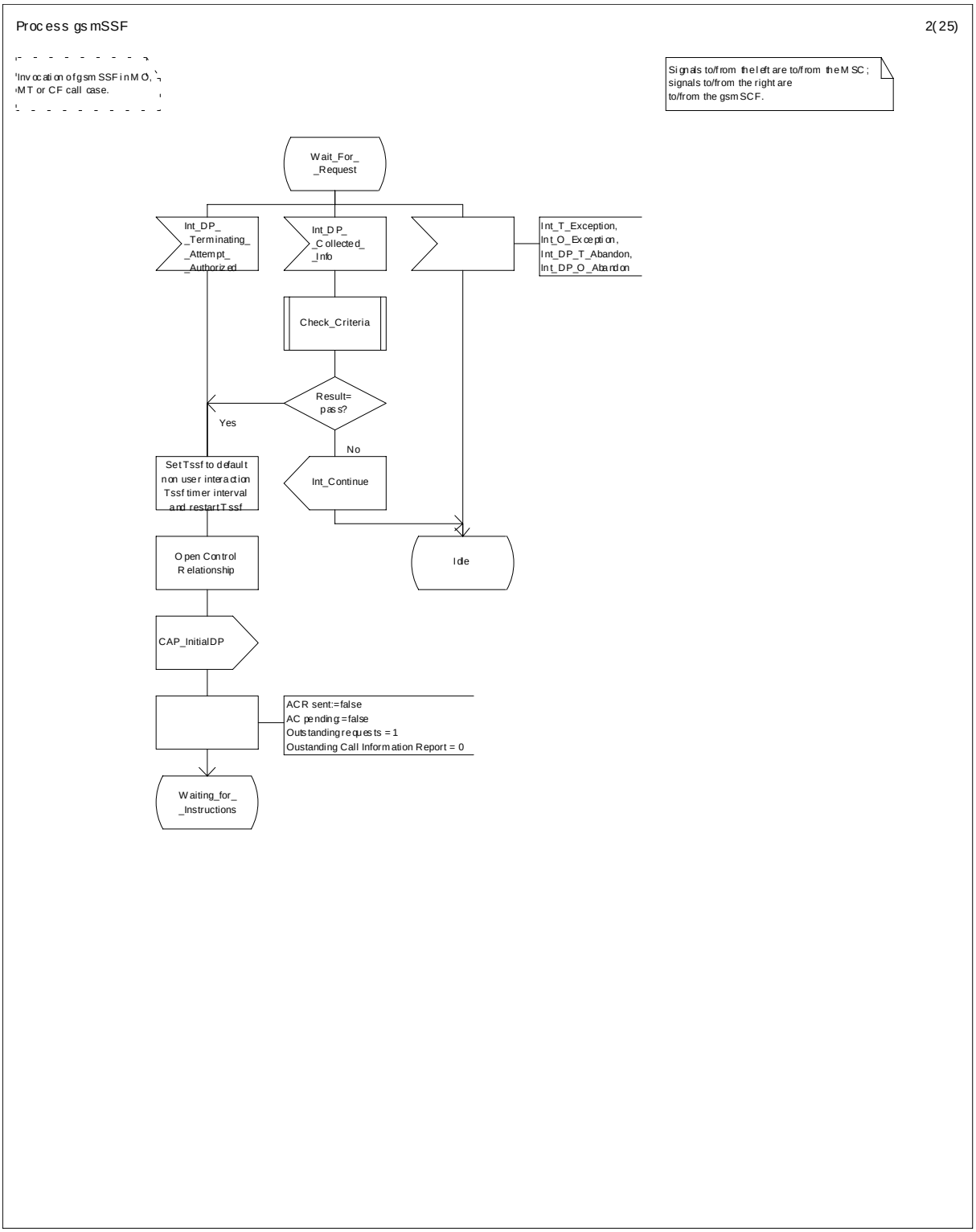

Figure 45b: Process gsmSSF (sheet 2)

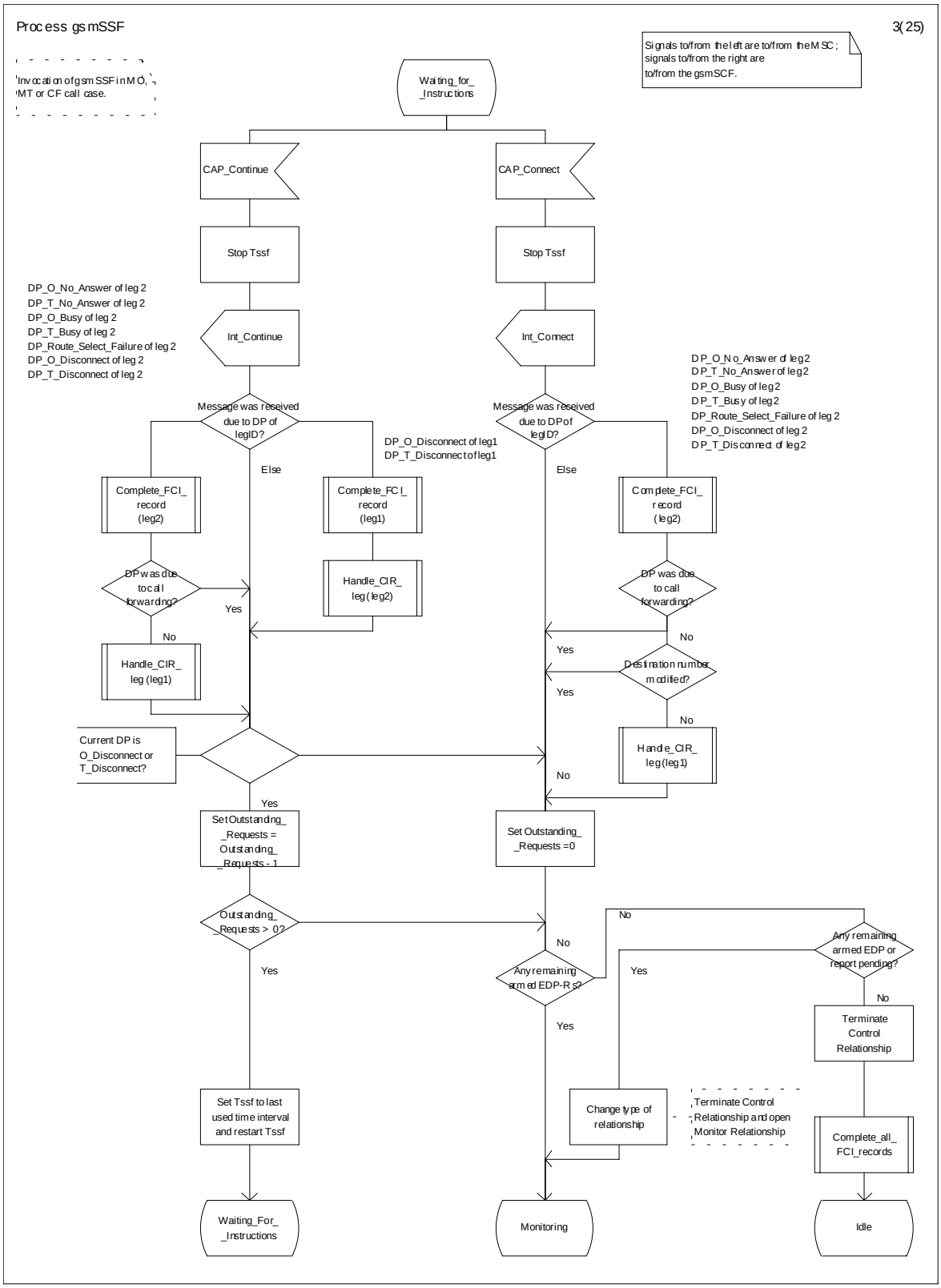

Figure 45c: Process gsmSSF (sheet 3)

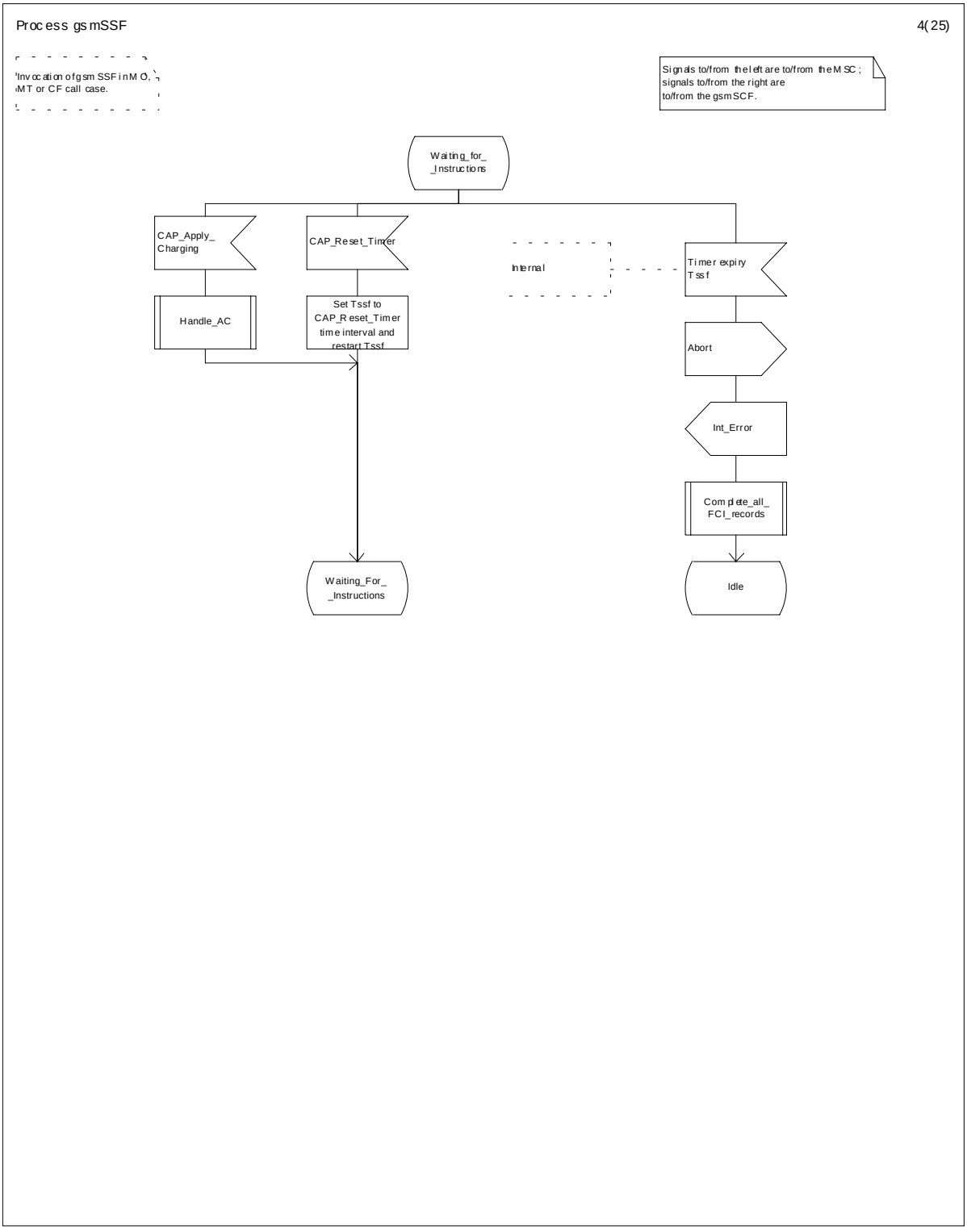

Figure 45c: Process gsmSSF (sheet 4)

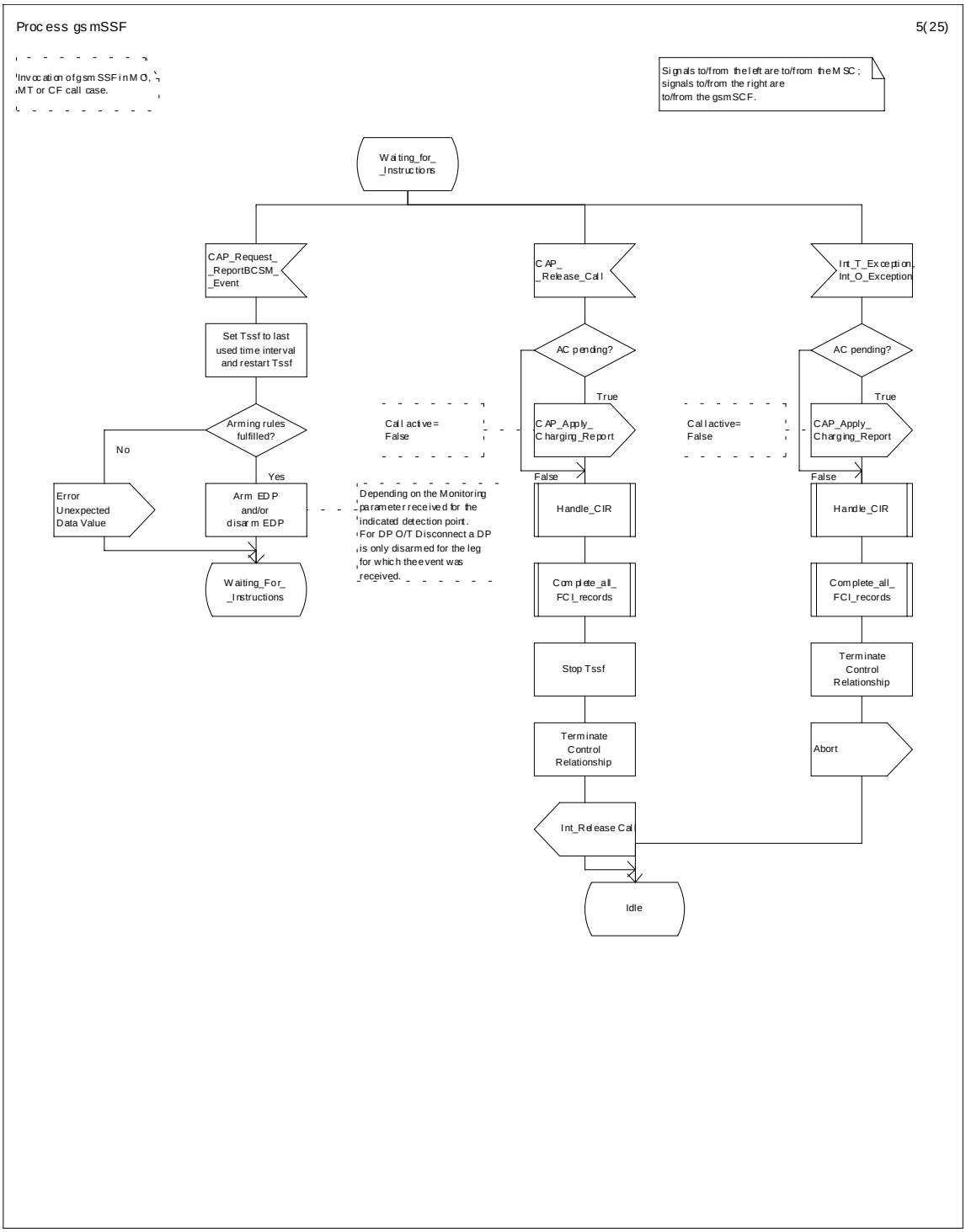

Figure 45d: Process gsmSSF (sheet 5)

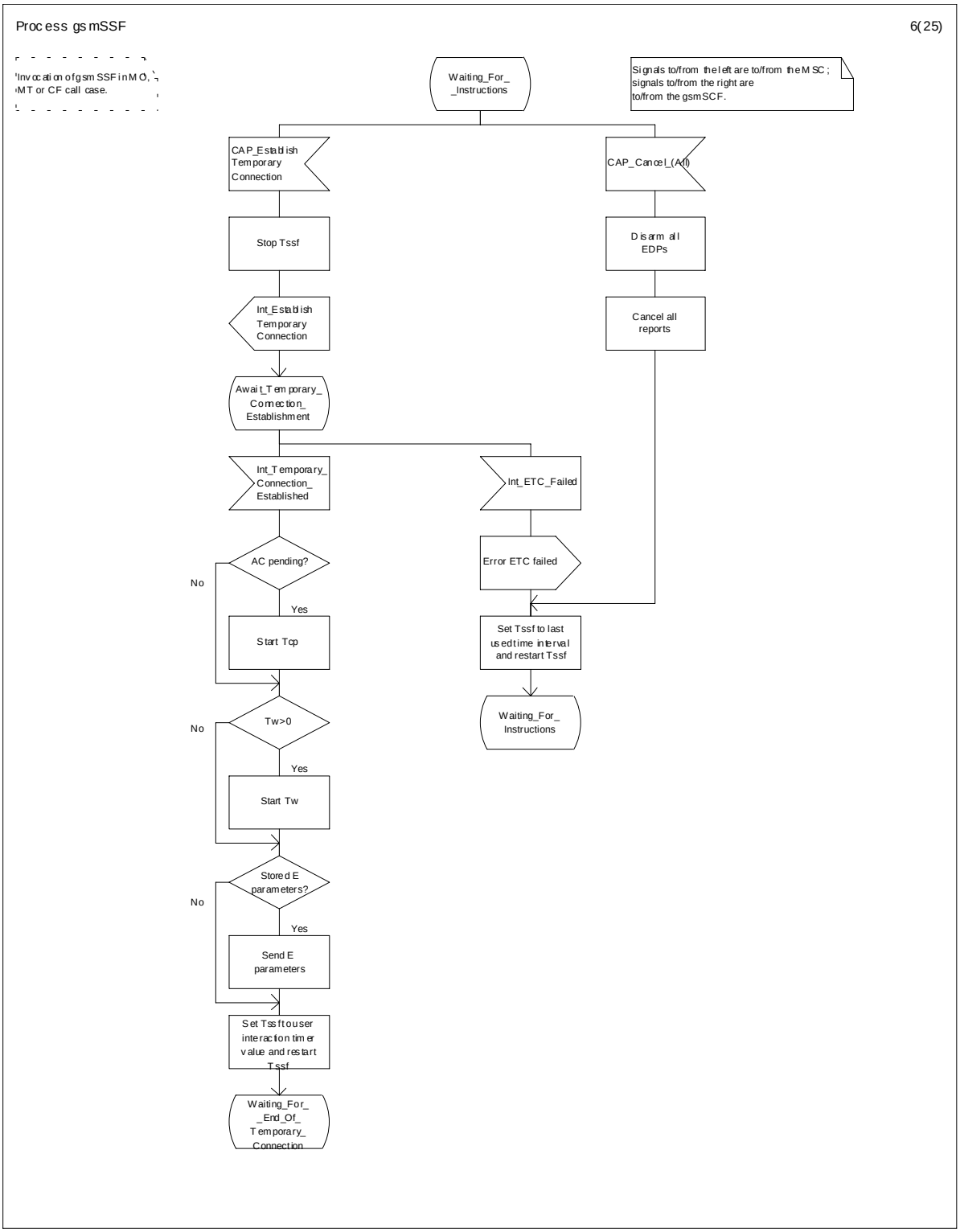

Figure 45e: Process gsmSSF (sheet 6)

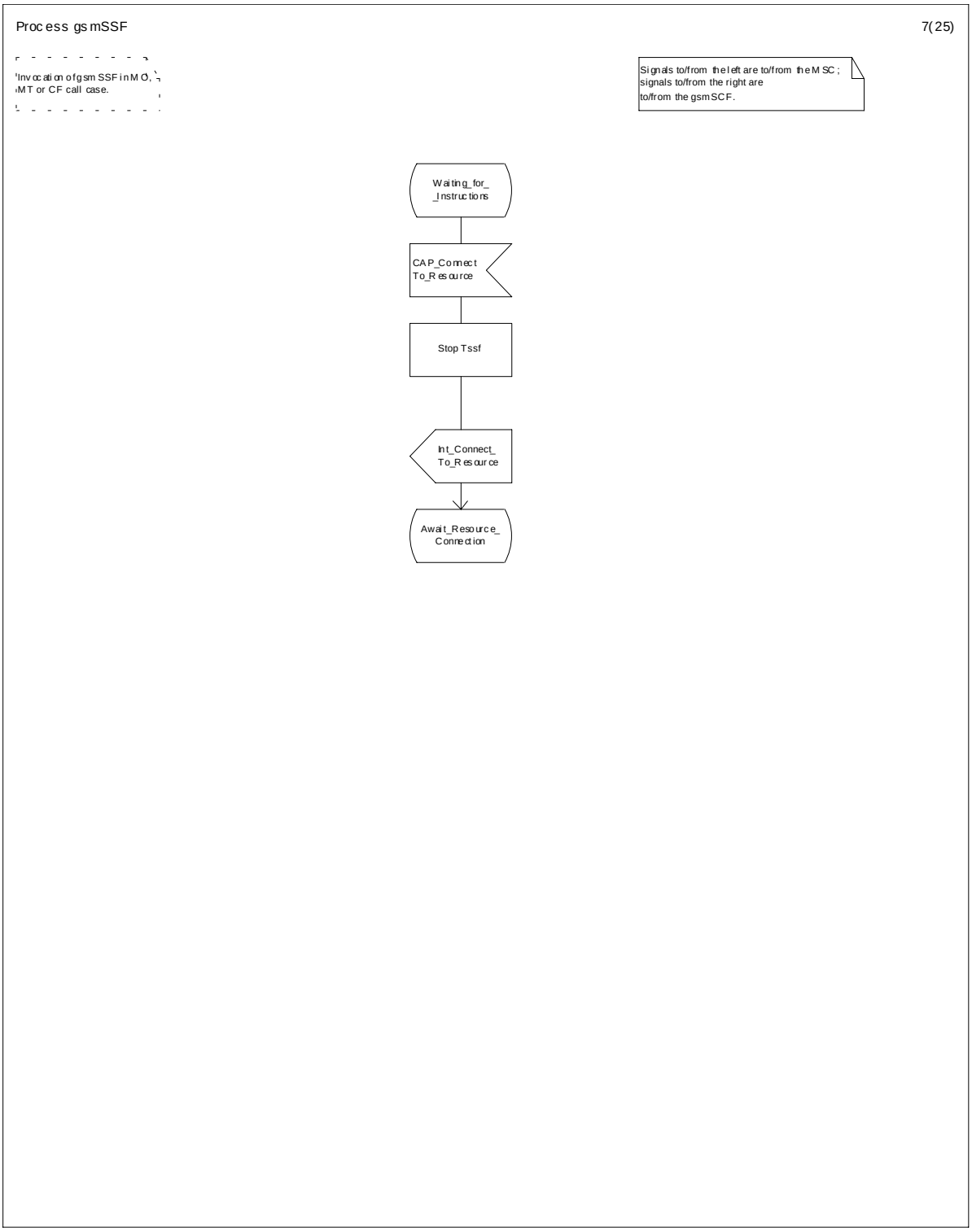

Figure 45f: Process gsmSSF (sheet 7)

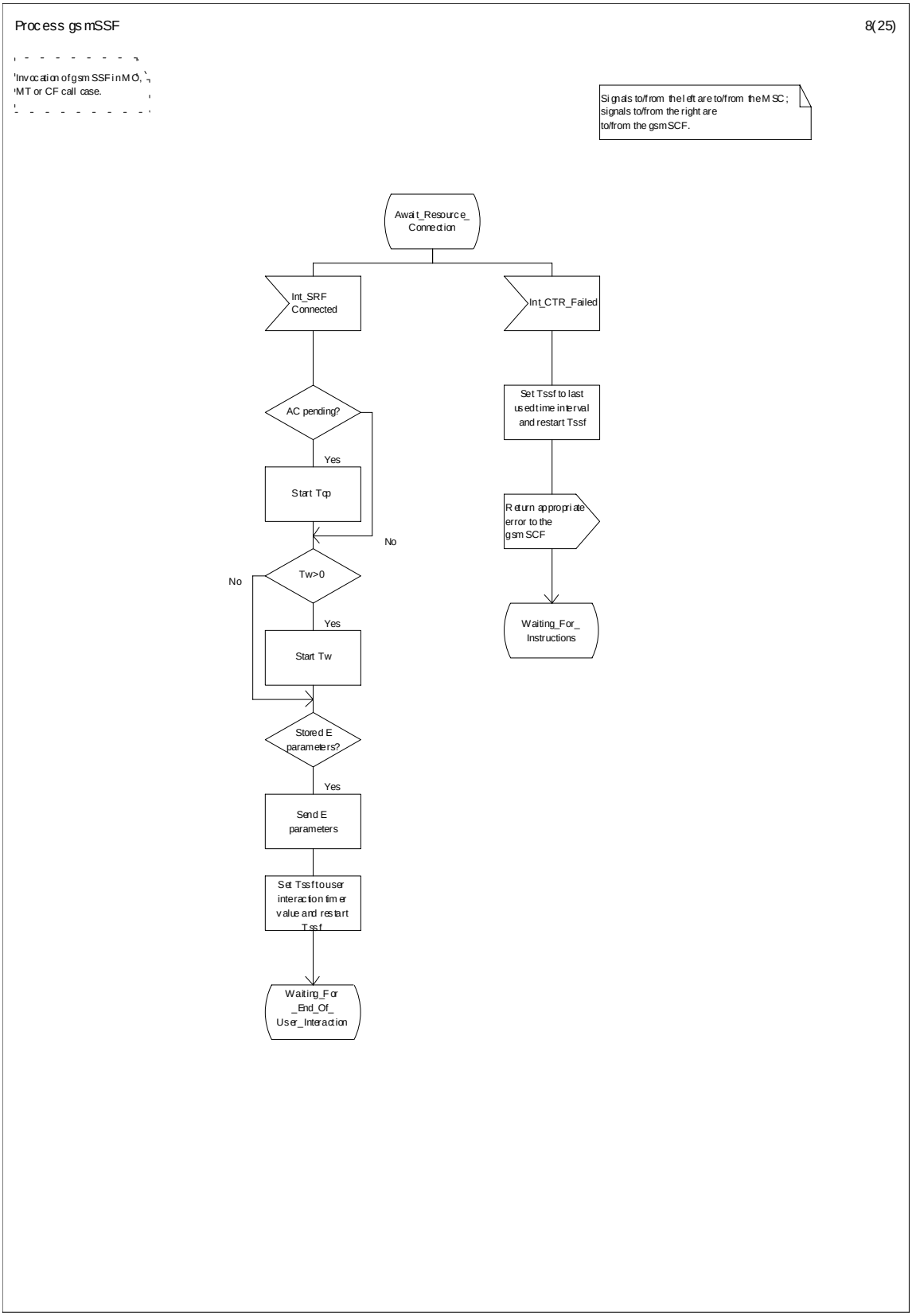

Figure 45g: Process gsmSSF (sheet 8)

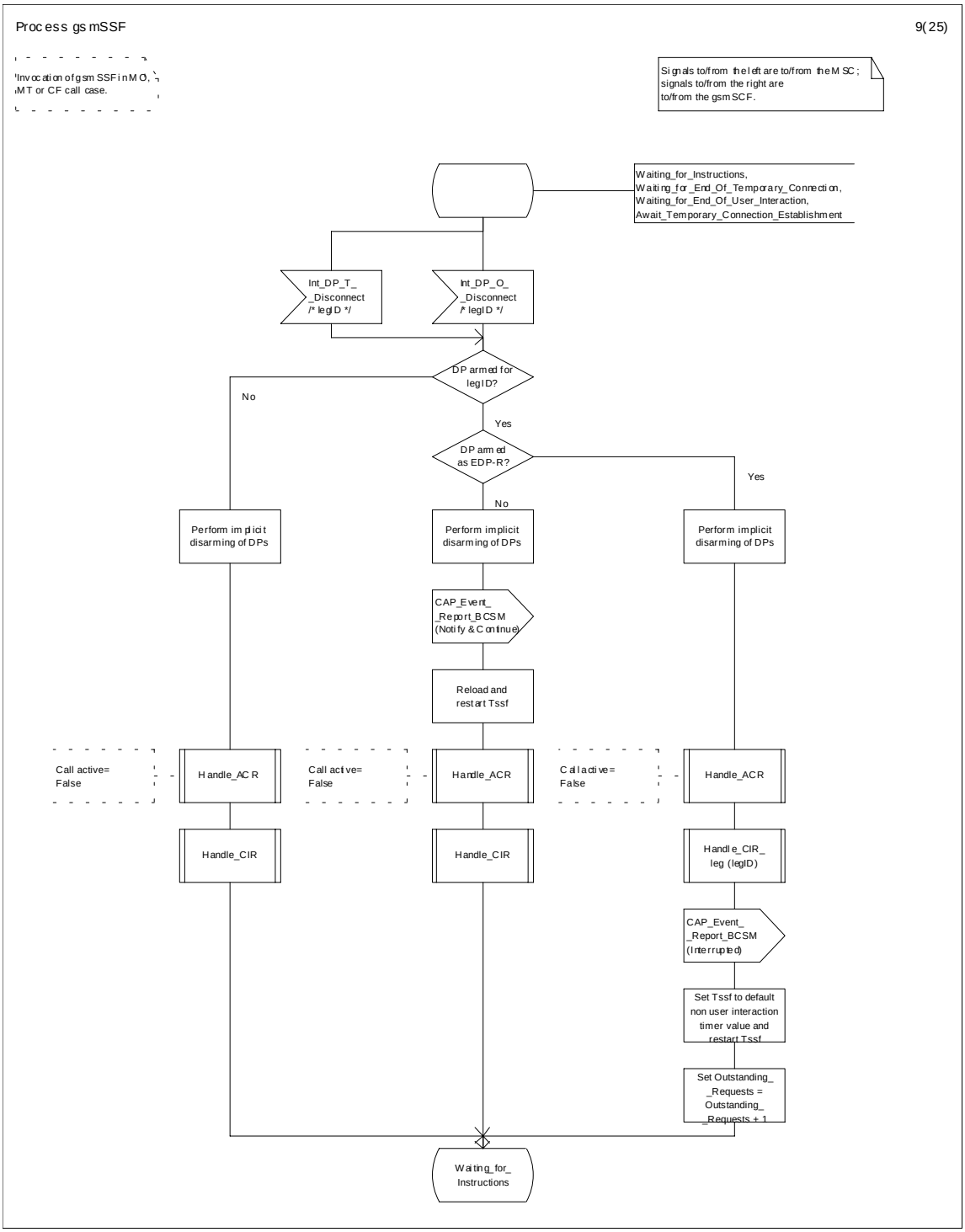

Figure 45h: Process gsmSSF (sheet 9)

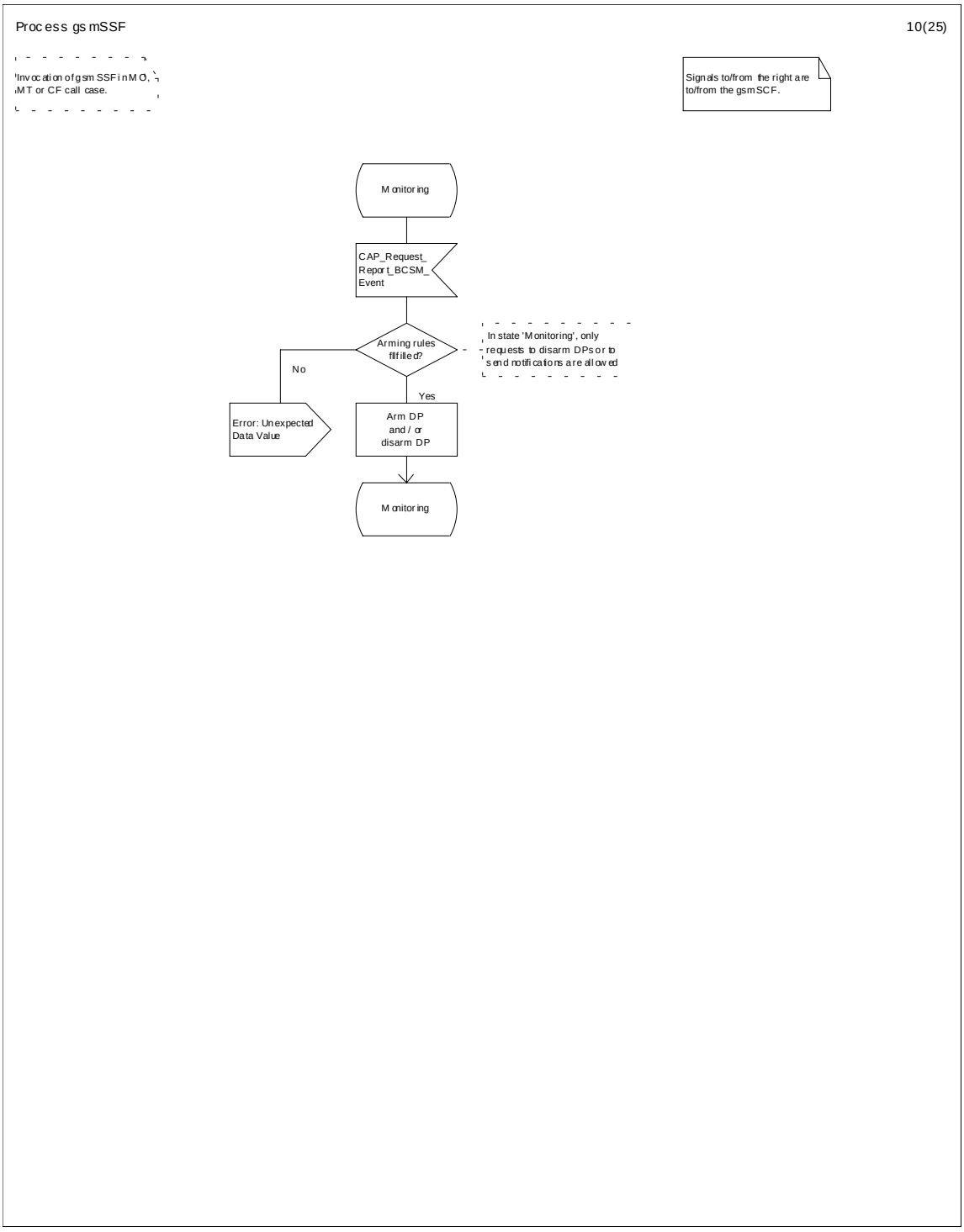

Figure 45i: Process gsmSSF (sheet 10)

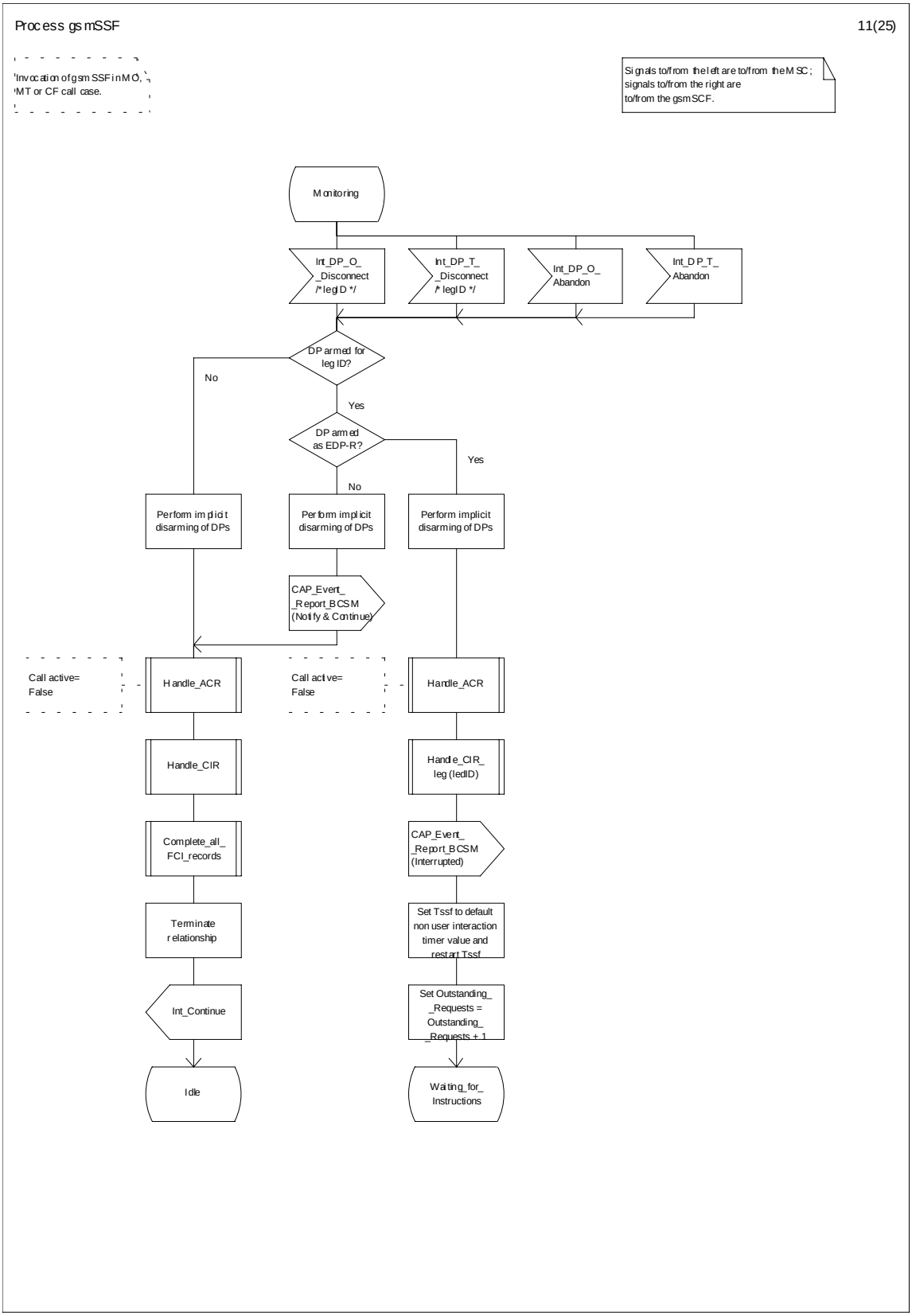

Figure 45j: Process gsmSSF (sheet 11)

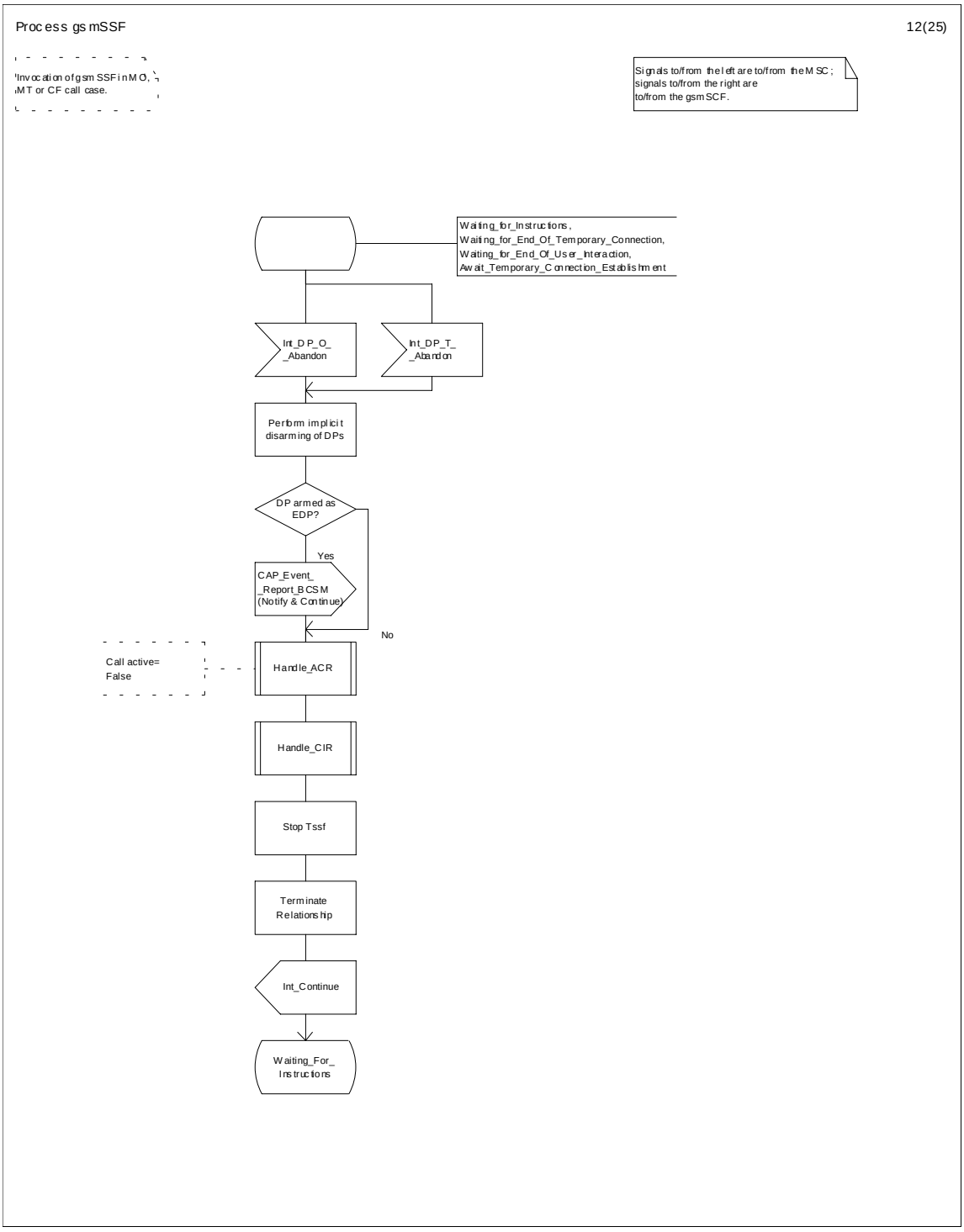

Figure 45k: Process gsmSSF (sheet 12)

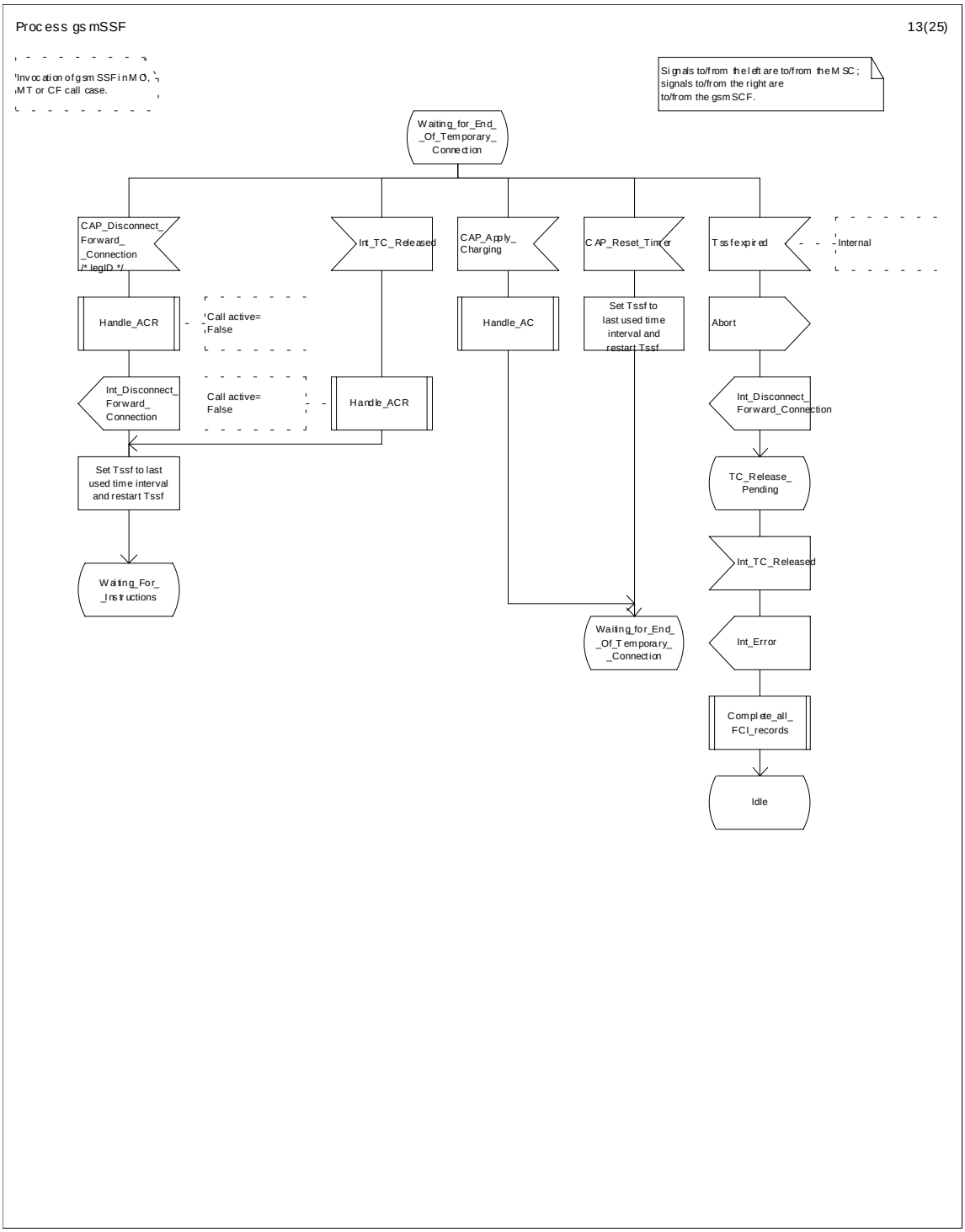

Figure 45l: Process gsmSSF (sheet 13)

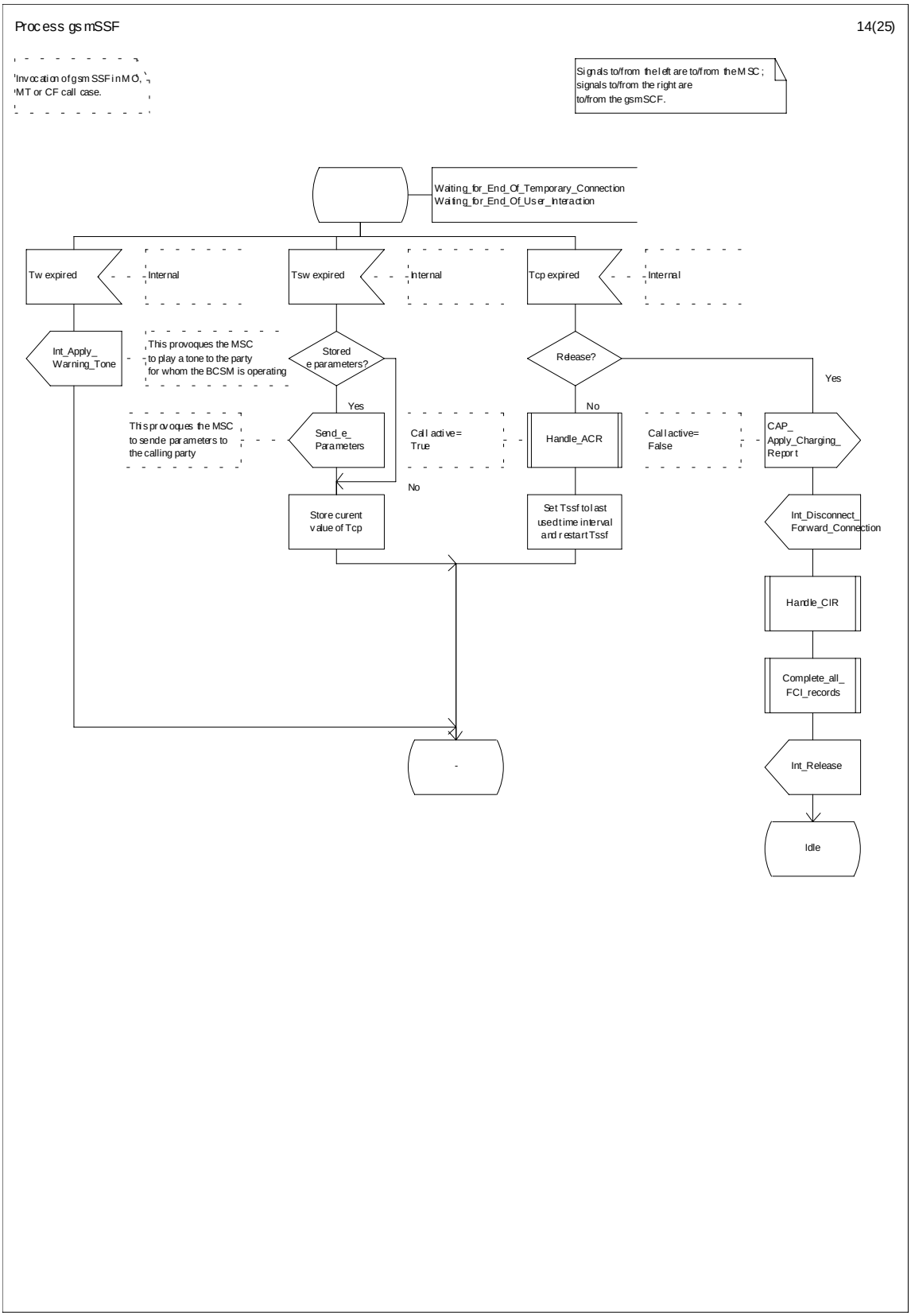

Figure 45m: Process gsmSSF (sheet 14)

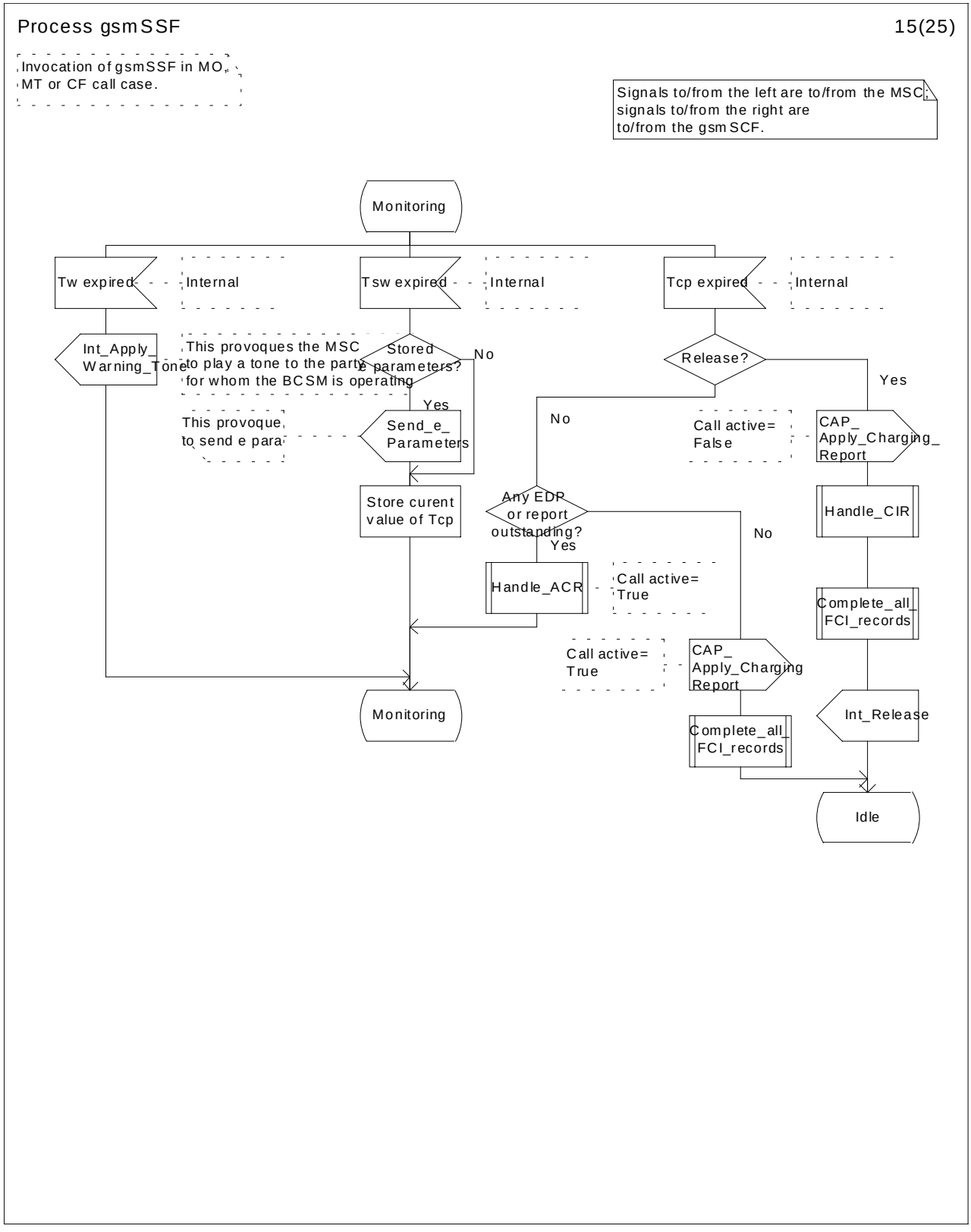

Figure 45n: Process gsmSSF (sheet 15)

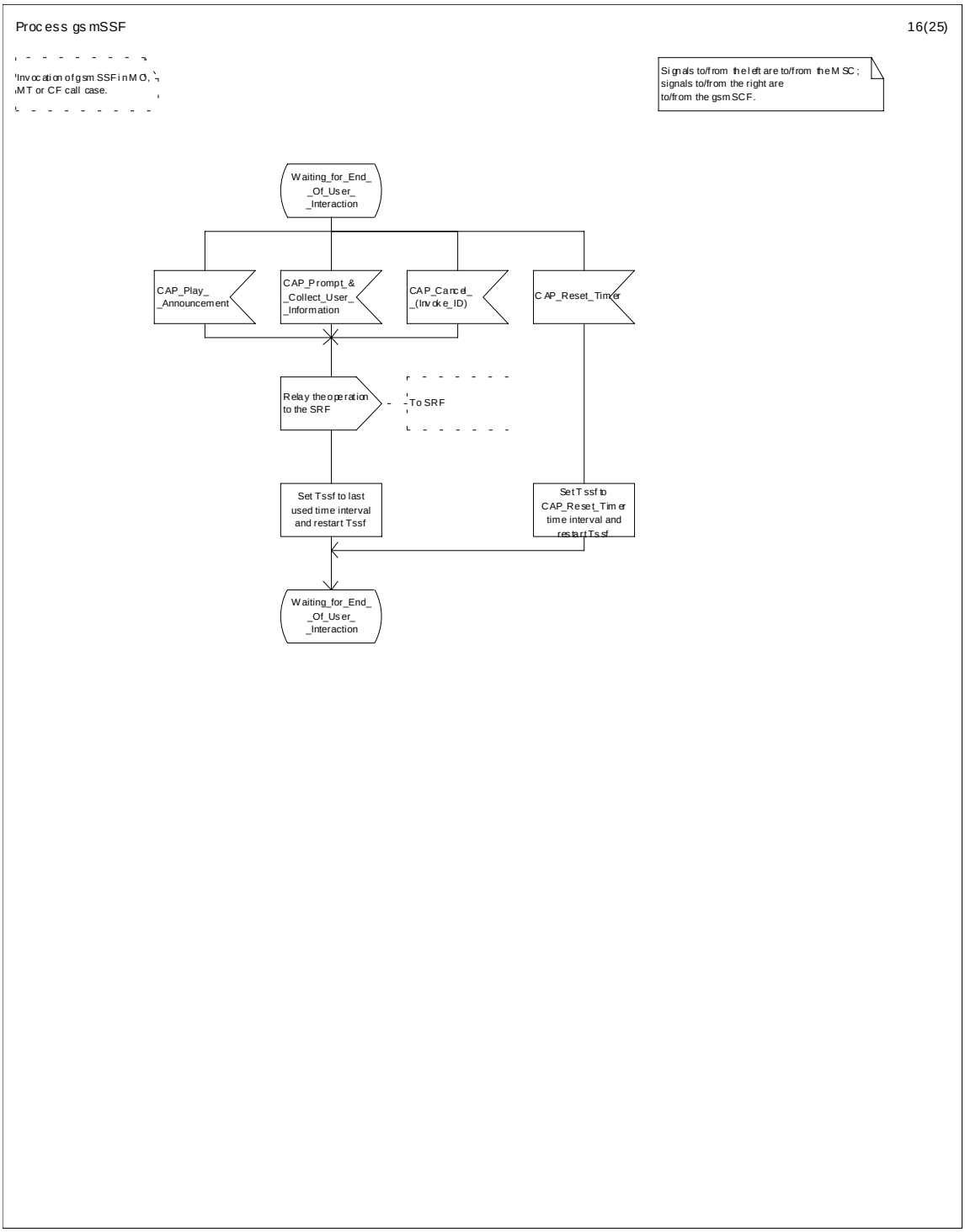

Figure 45o: Process gsmSSF (sheet 16)

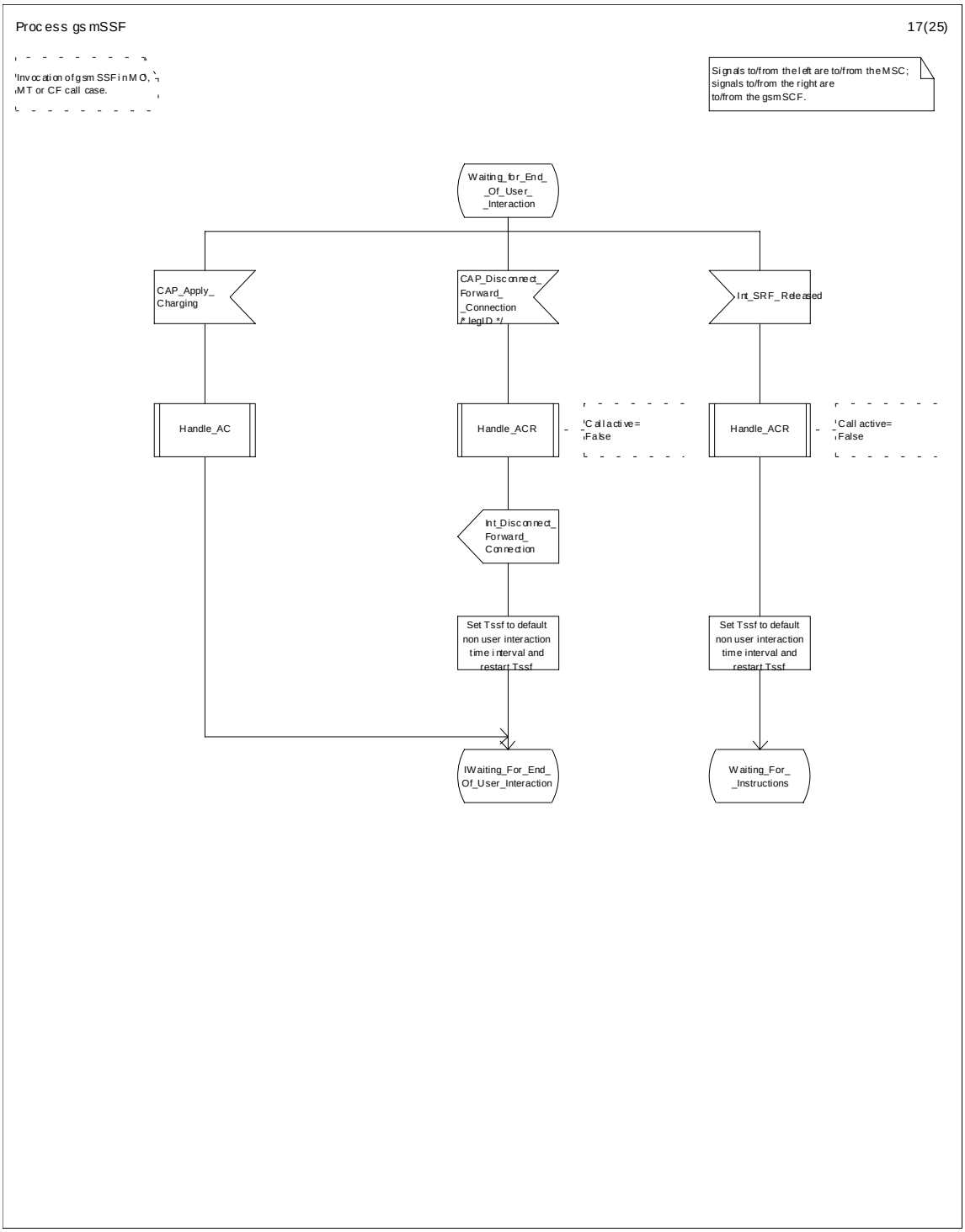

Figure 45o: Process gsmSSF (sheet 17)

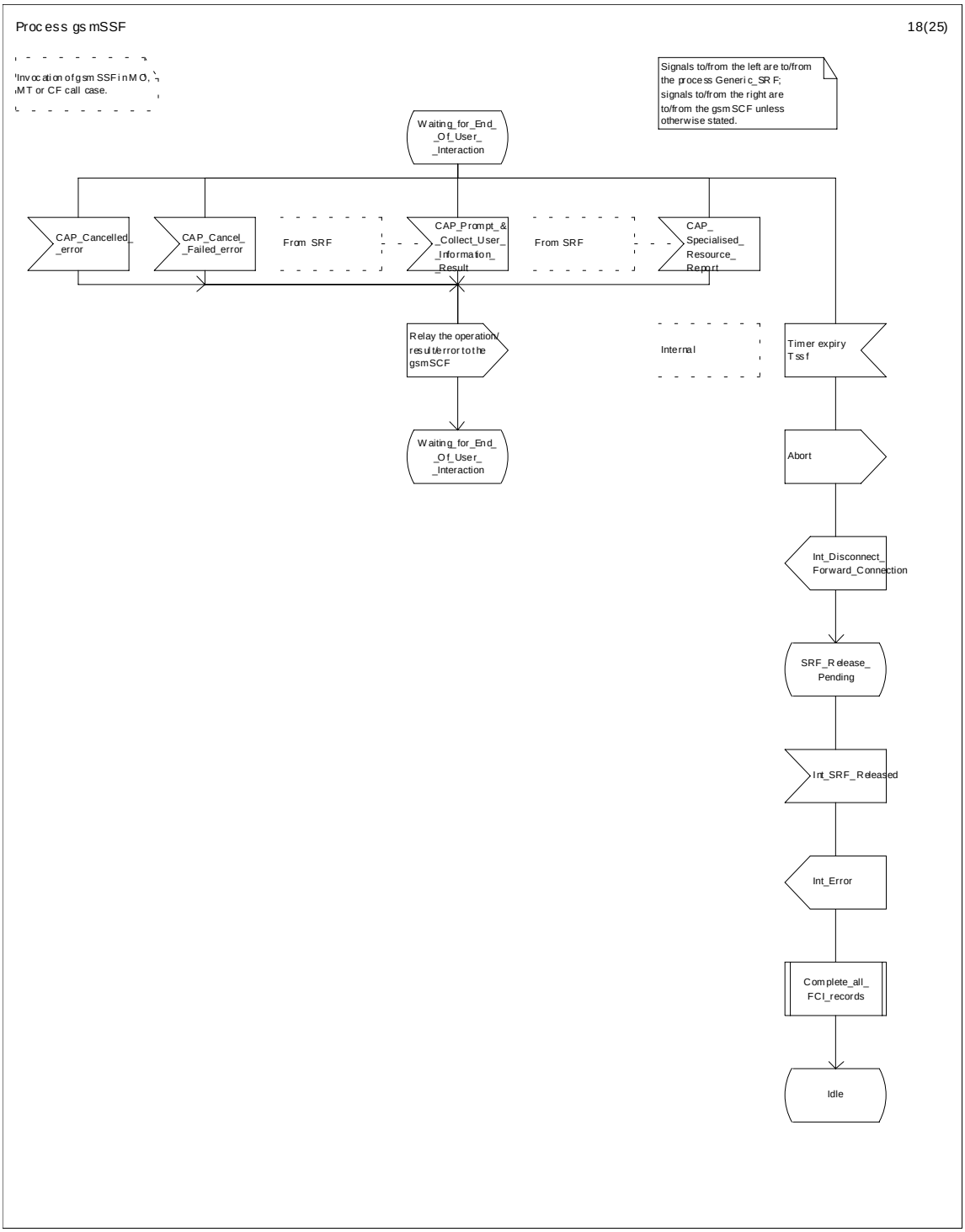

Figure 45p: Process gsmSSF (sheet 18)

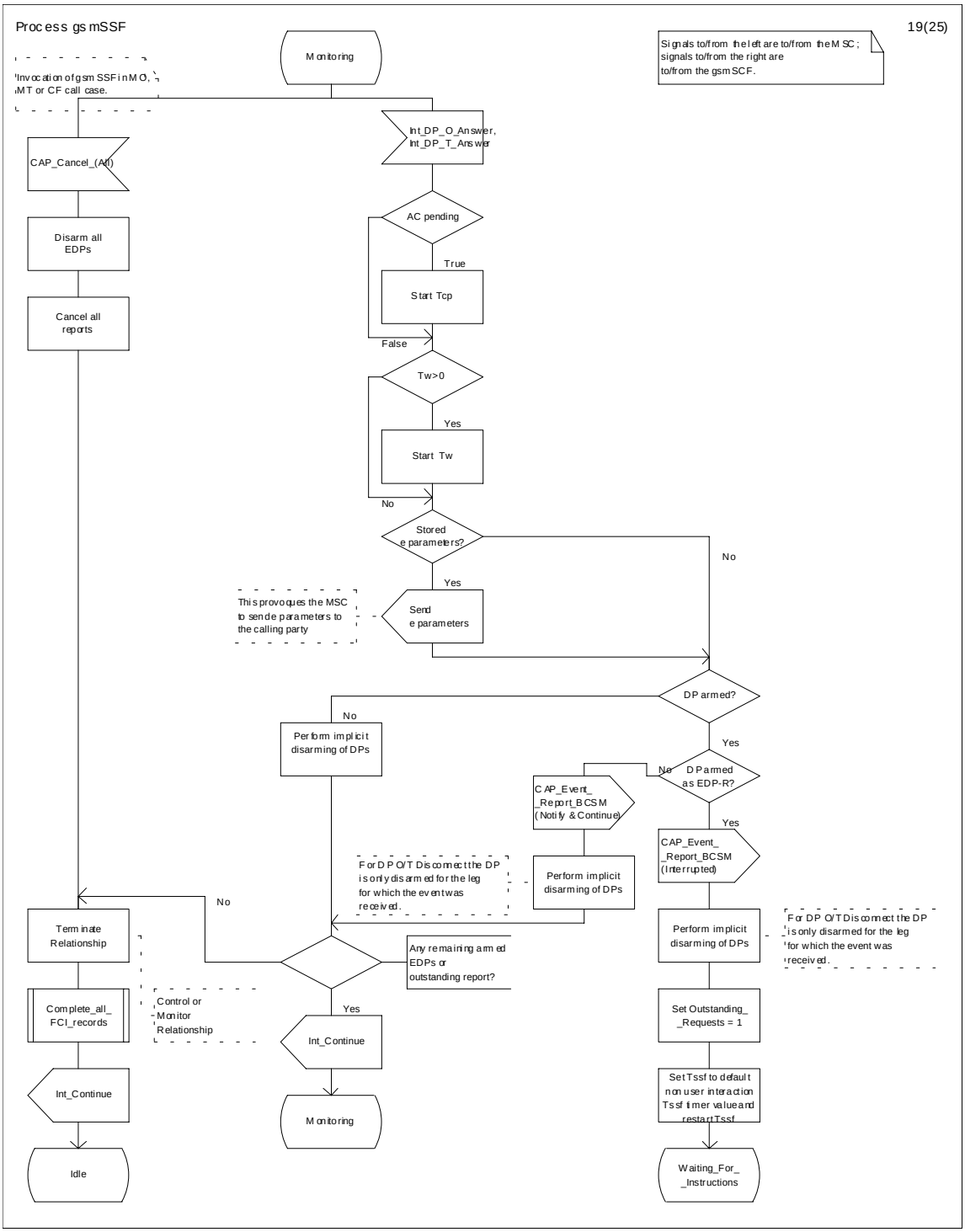

Figure 45q: Process gsmSSF (sheet 19)

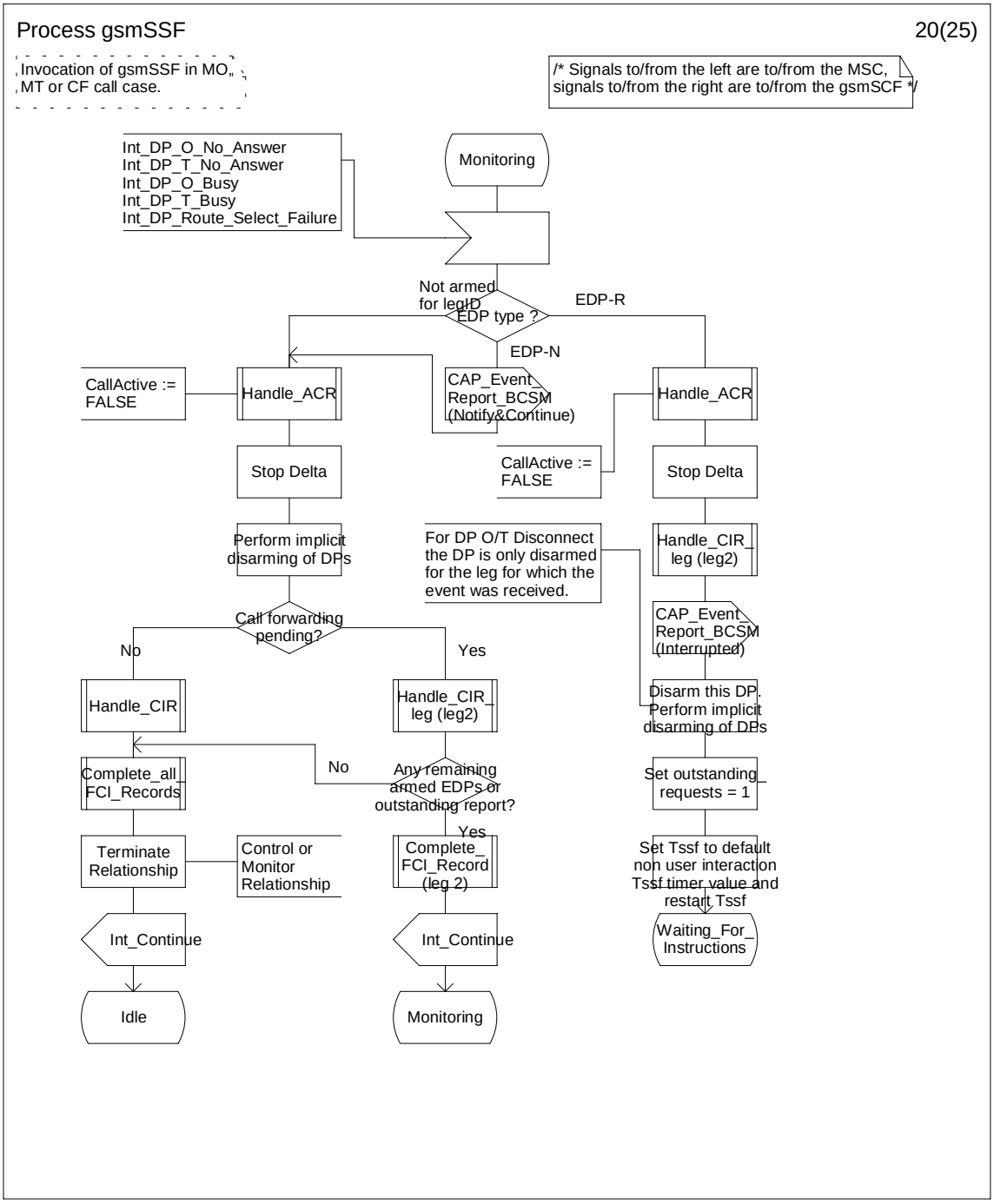

Figure 45r: Process gsmSSF (sheet 20)

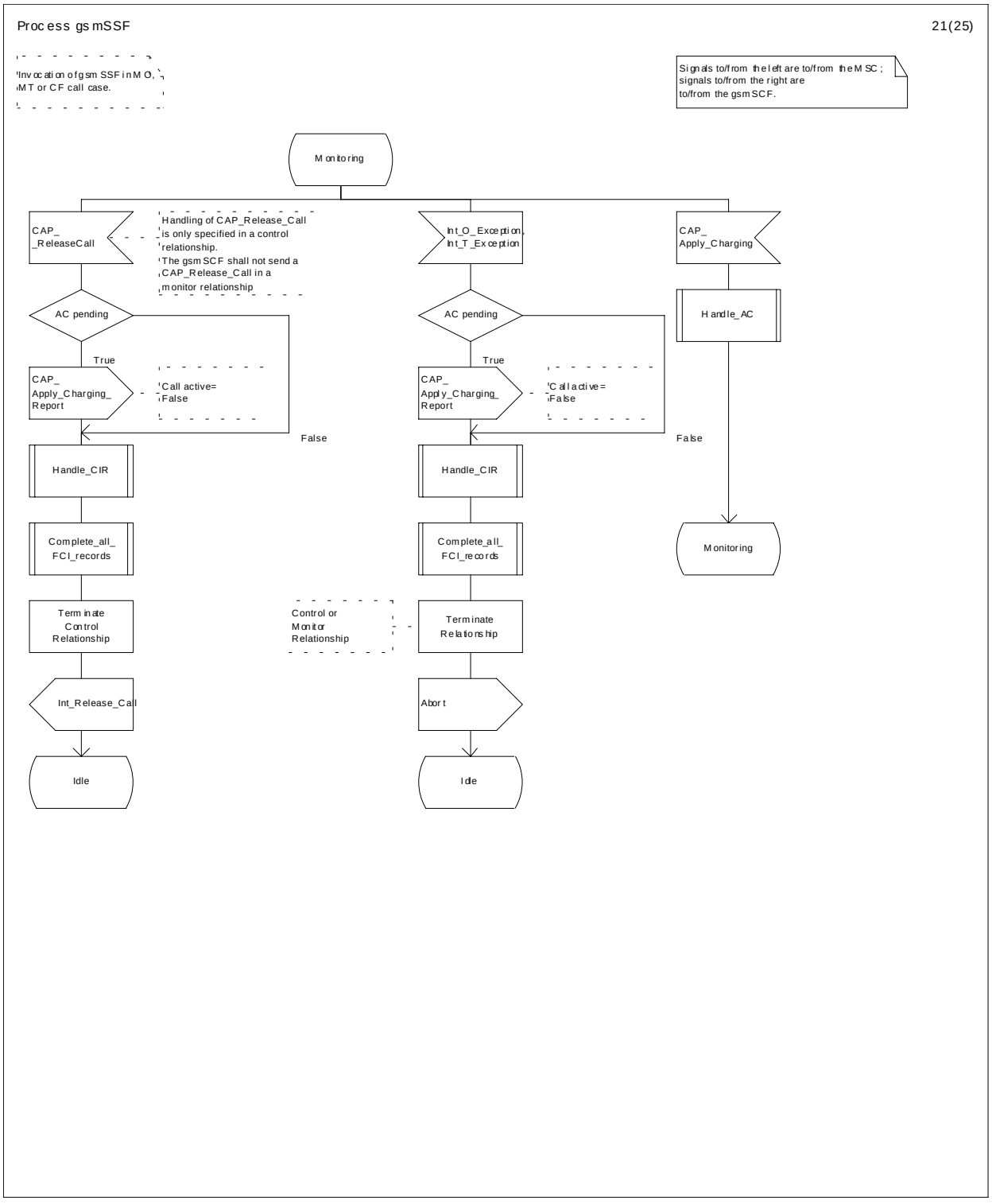

Figure 45s: Process gsmSSF (sheet 21)

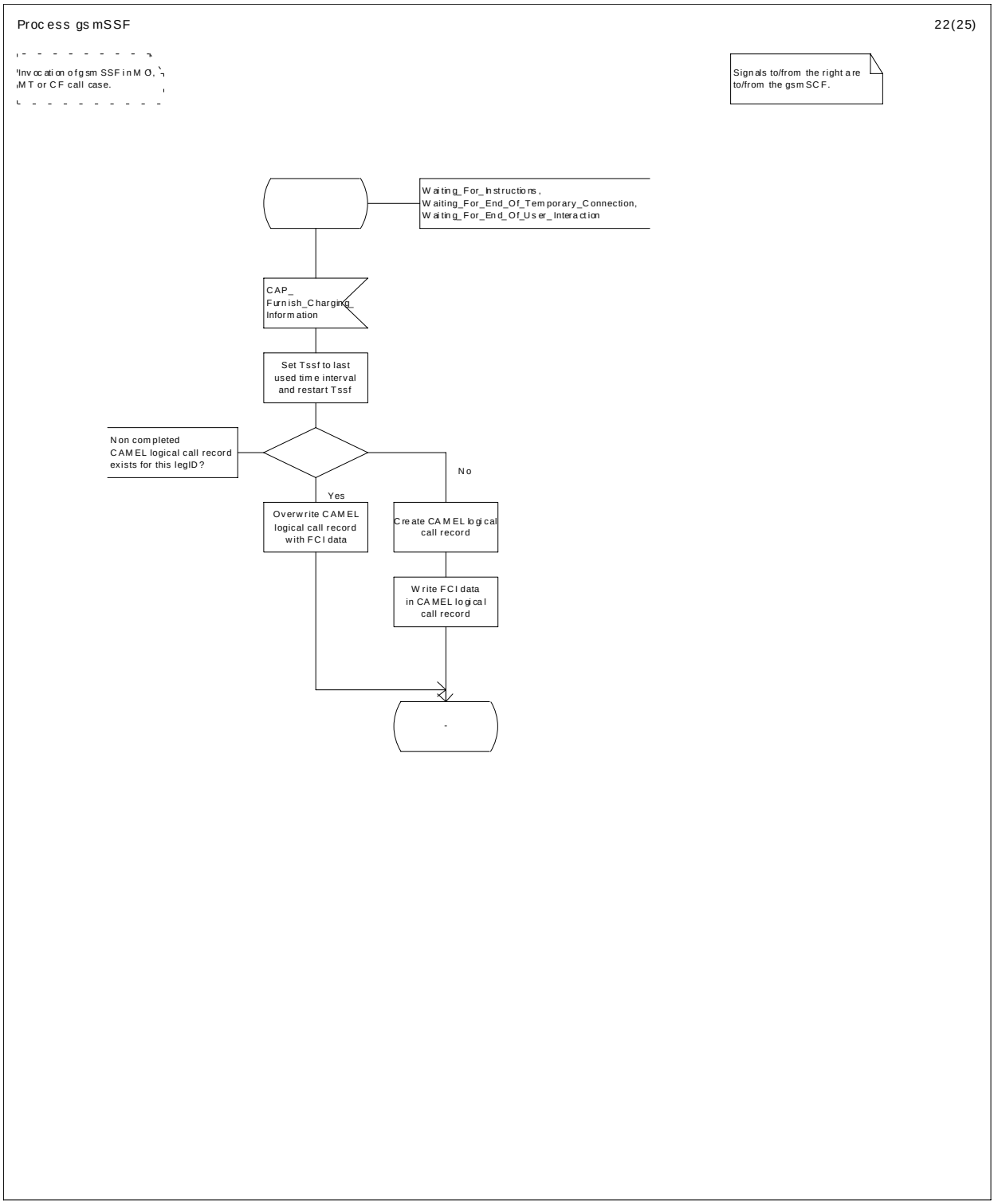

Figure 45t: Process gsmSSF (sheet 22)

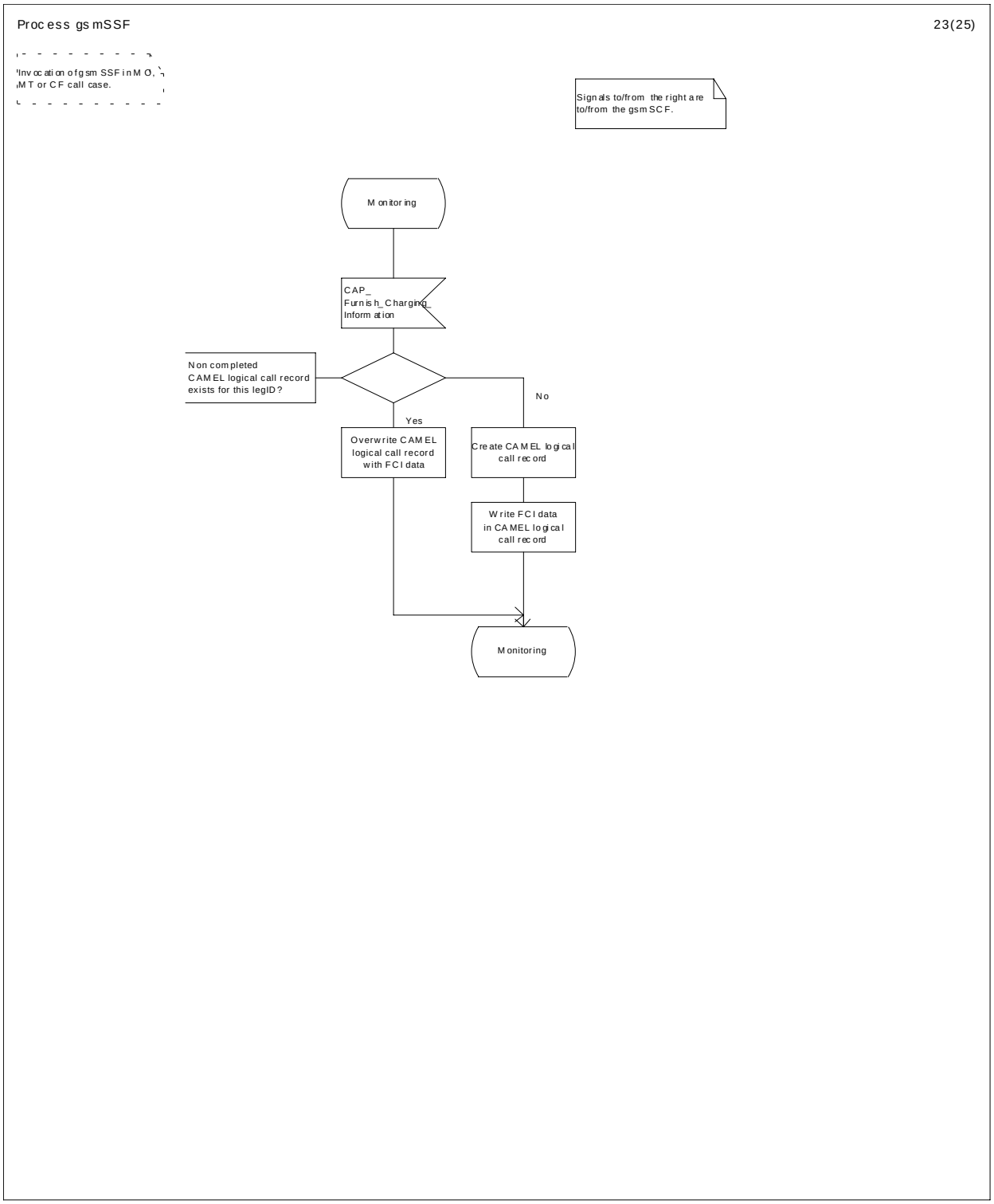

Figure 45t: Process gsmSSF (sheet 23)

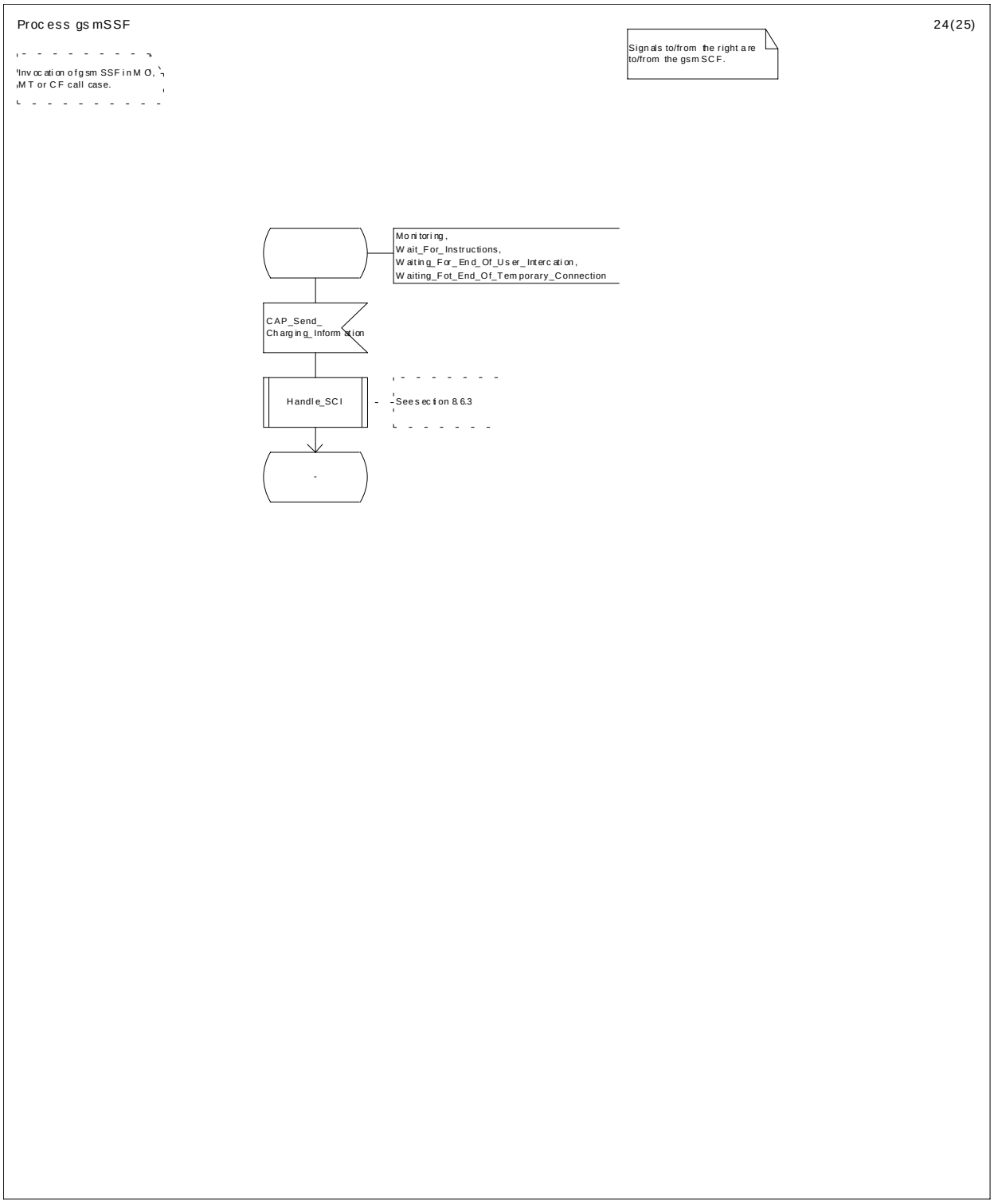

Figure 45t: Process gsmSSF (sheet 24)

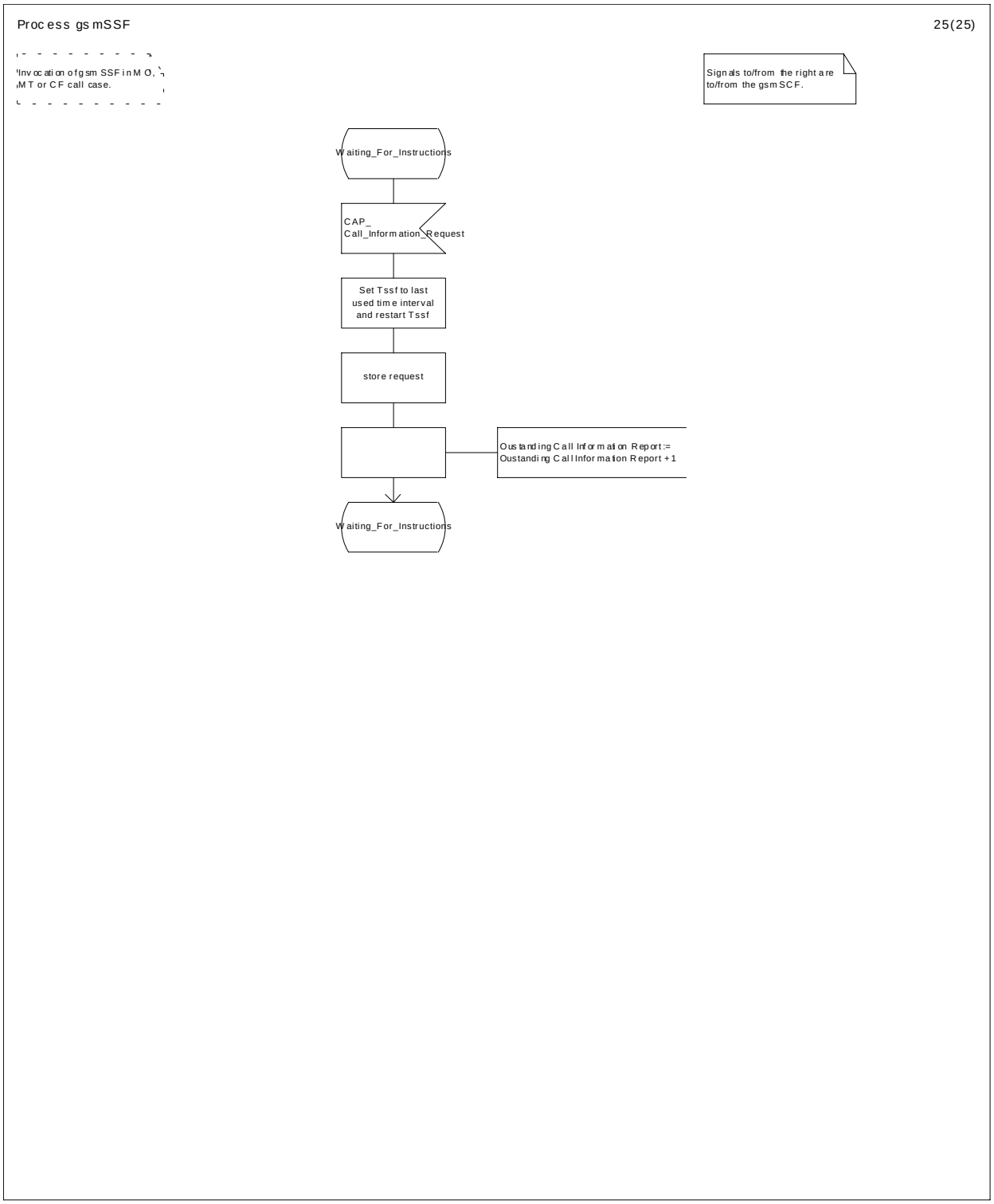

Figure 45t: Process gsmSSF (sheet 25)

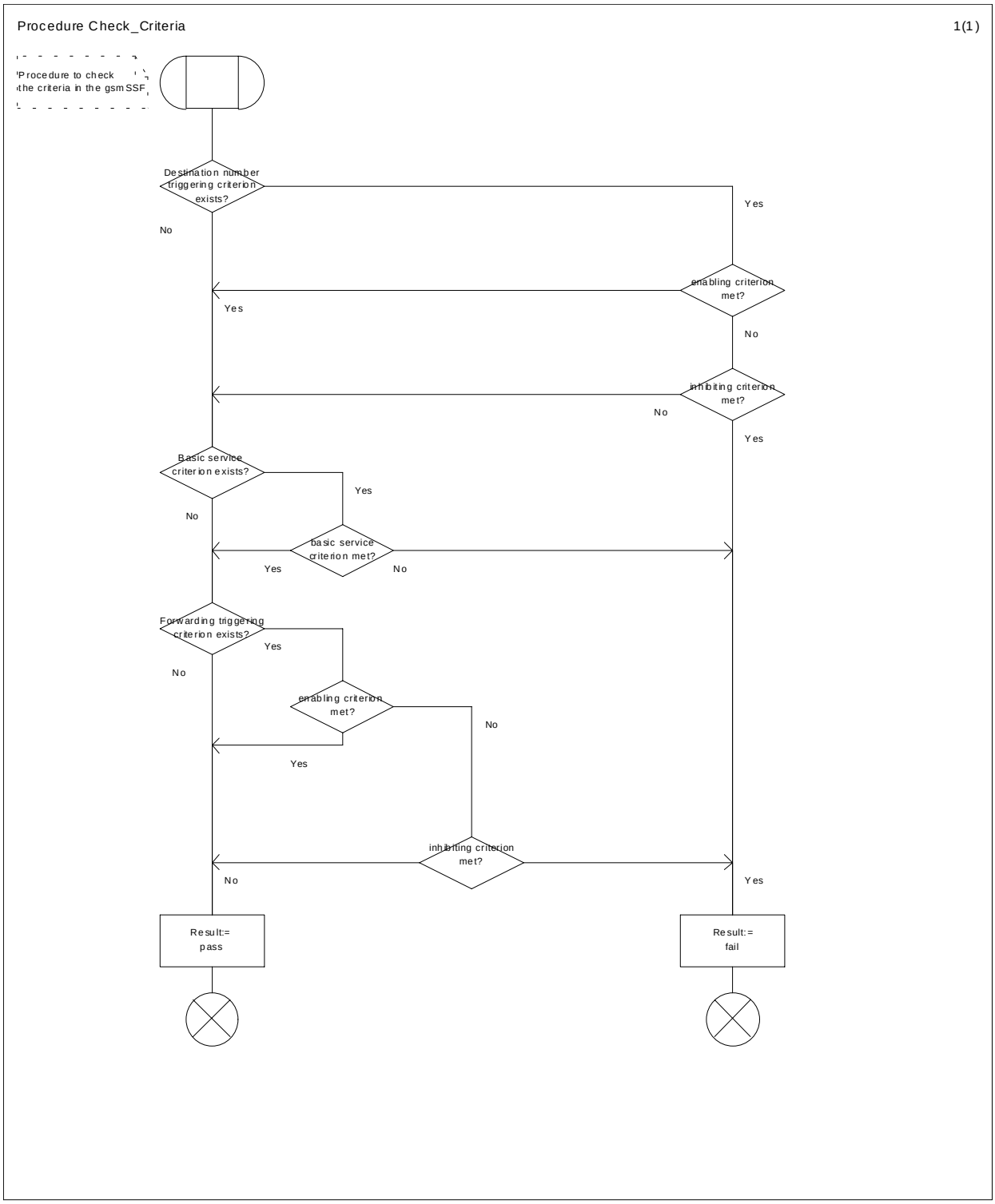

Figure 46a: Procedure Check_Criteria (sheet 1)

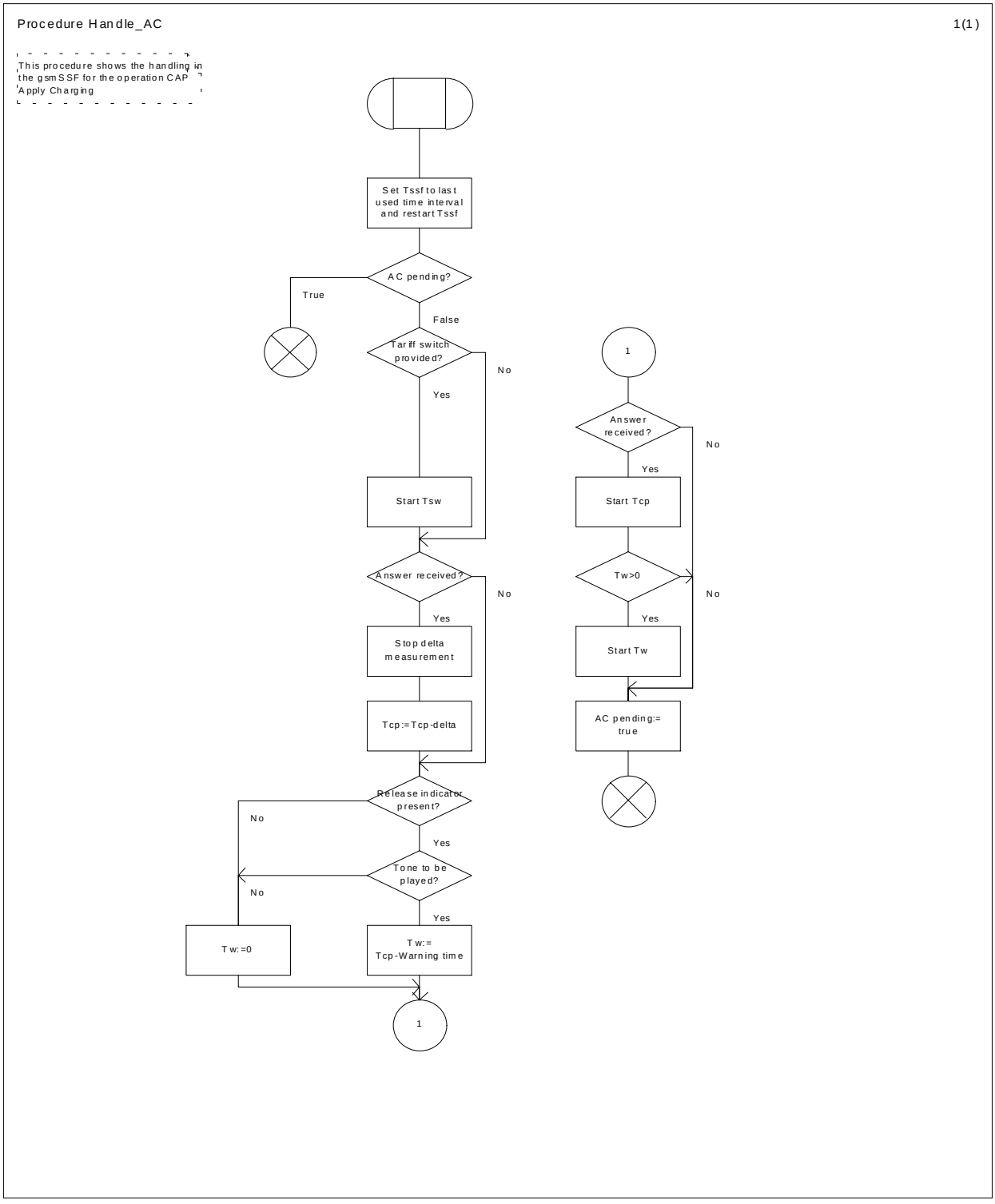

Figure 47a: Procedure Handle_AC (sheet 1)

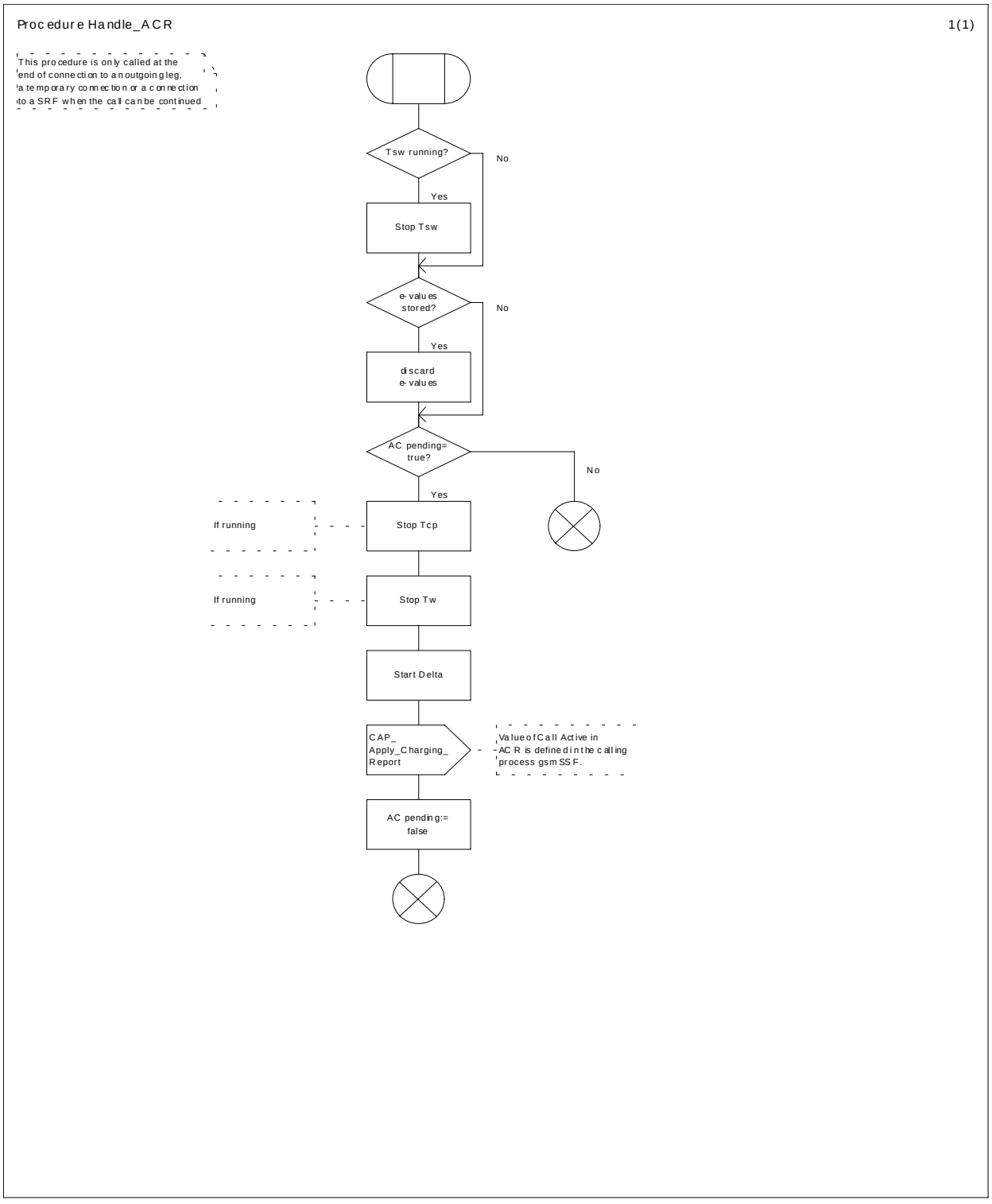

Figure 48a: Procedure Handle_ACR (sheet 1)

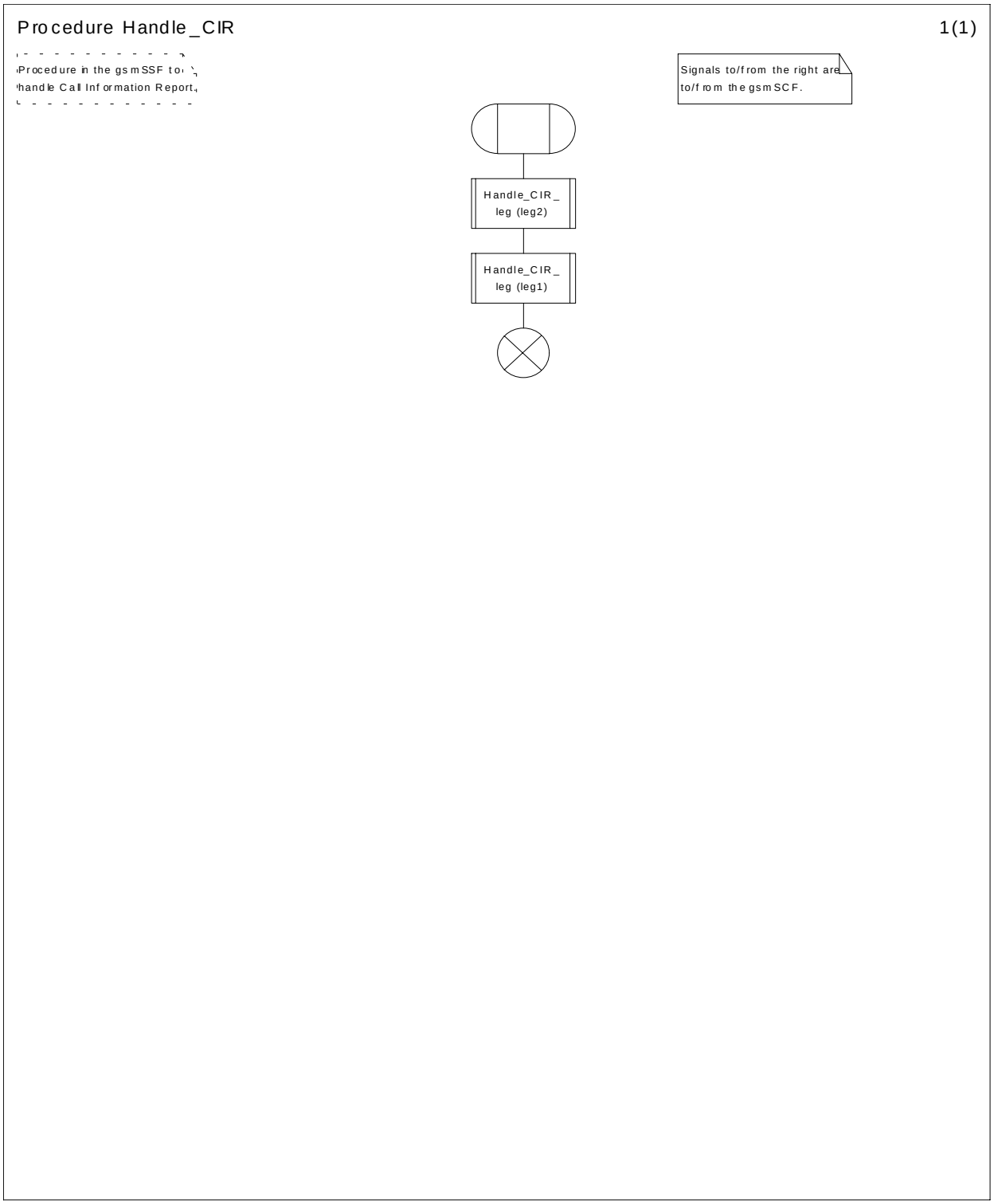

Figure 49a: Procedure Handle_CIR (sheet 1)

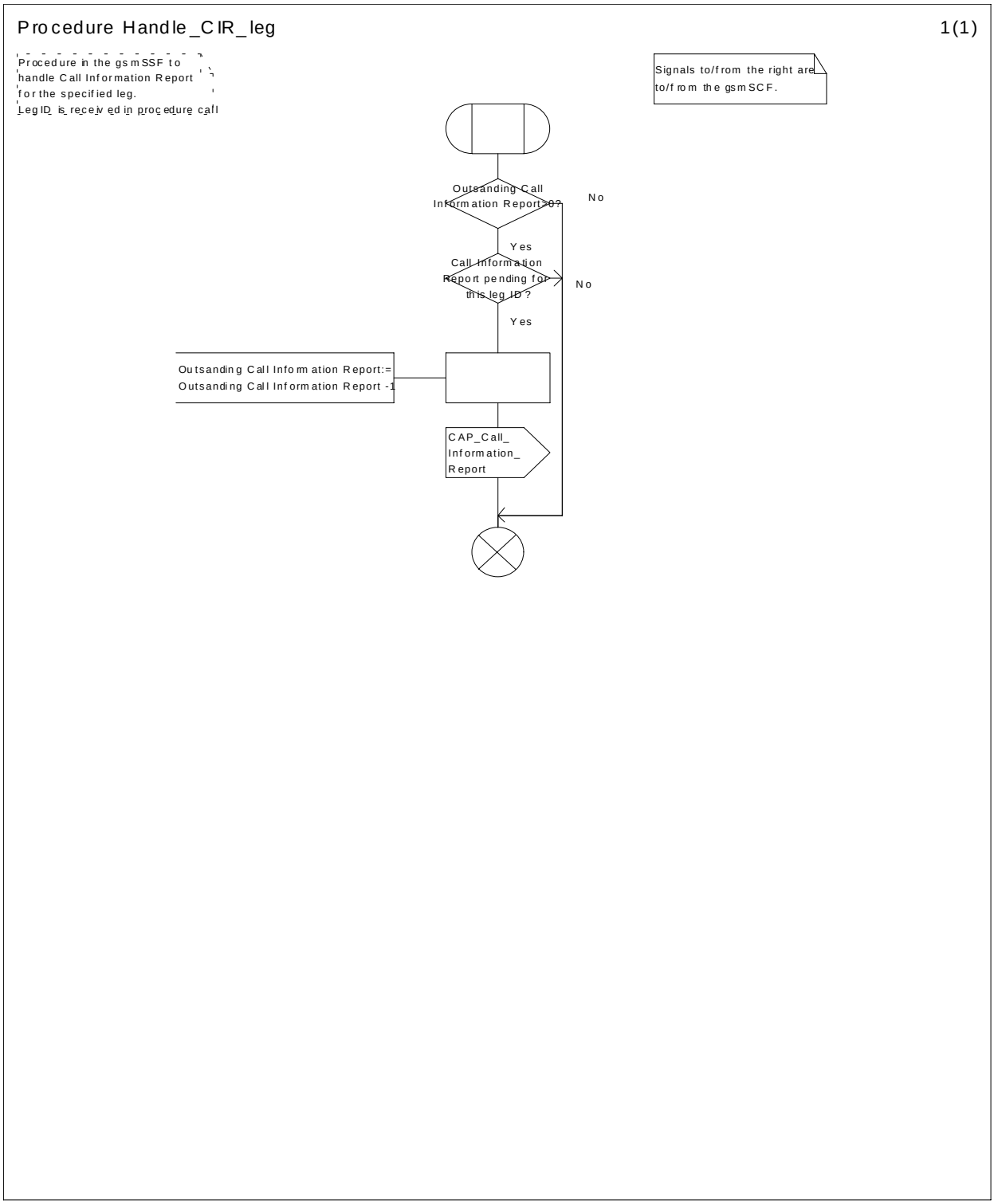

Figure 50a: Procedure Handle_CIR_leg (sheet 1)

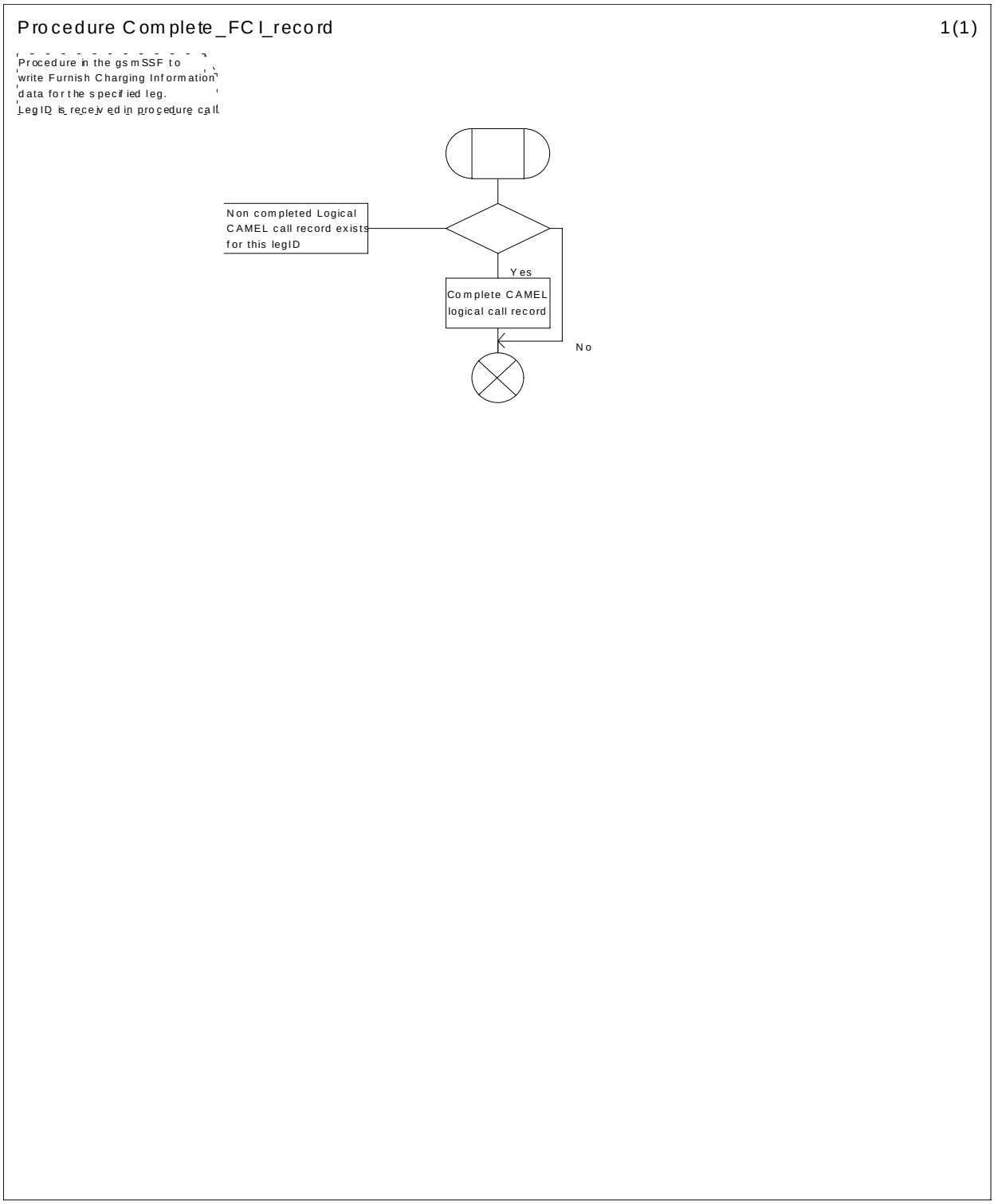

Figure 51a: Procedure Complete_FCI_record (sheet 1)

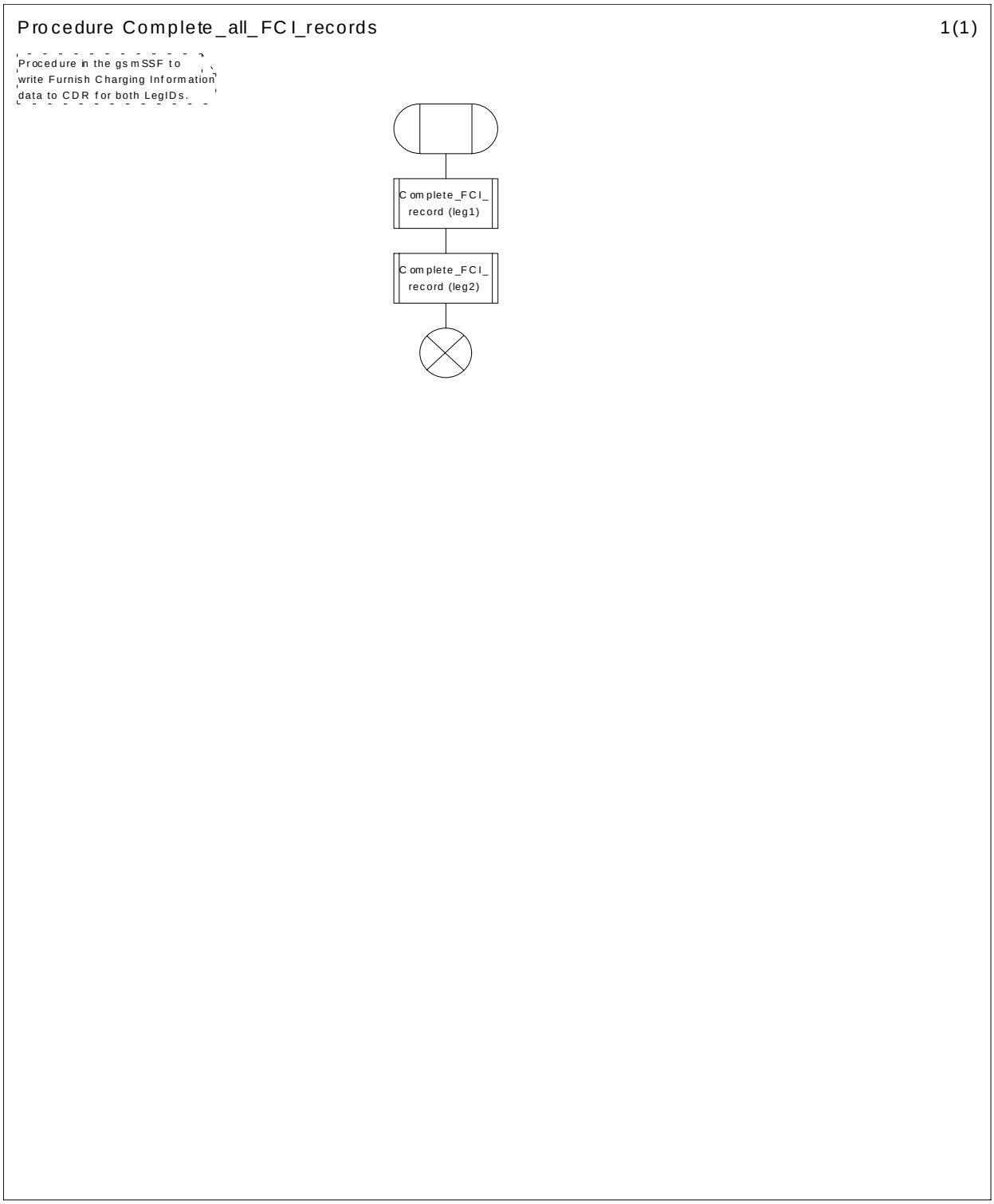

Figure 52a: Procedure Complete_all_FCI_records (sheet 1)

8.7 Assisting case

Assisting case involves the following processes :

- CAMEL_Assisting_MSC,
- Assisting_gsmSSF.

The detailed error handling for these 2 processes is specified in 3GPP TS 09.78 ([5]).

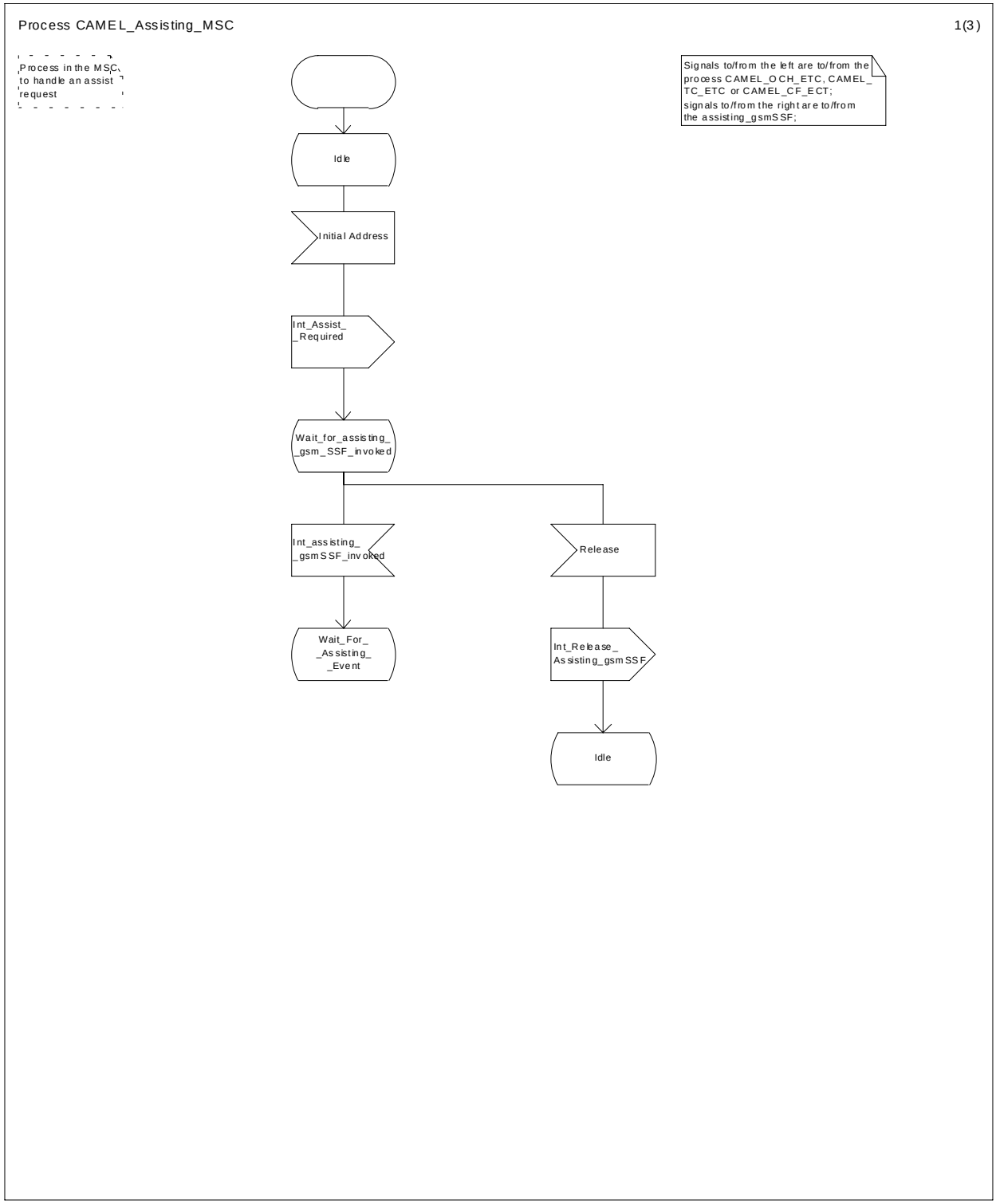

Figure 53a: Process CAMEL_Assisting_MSC (sheet 1)

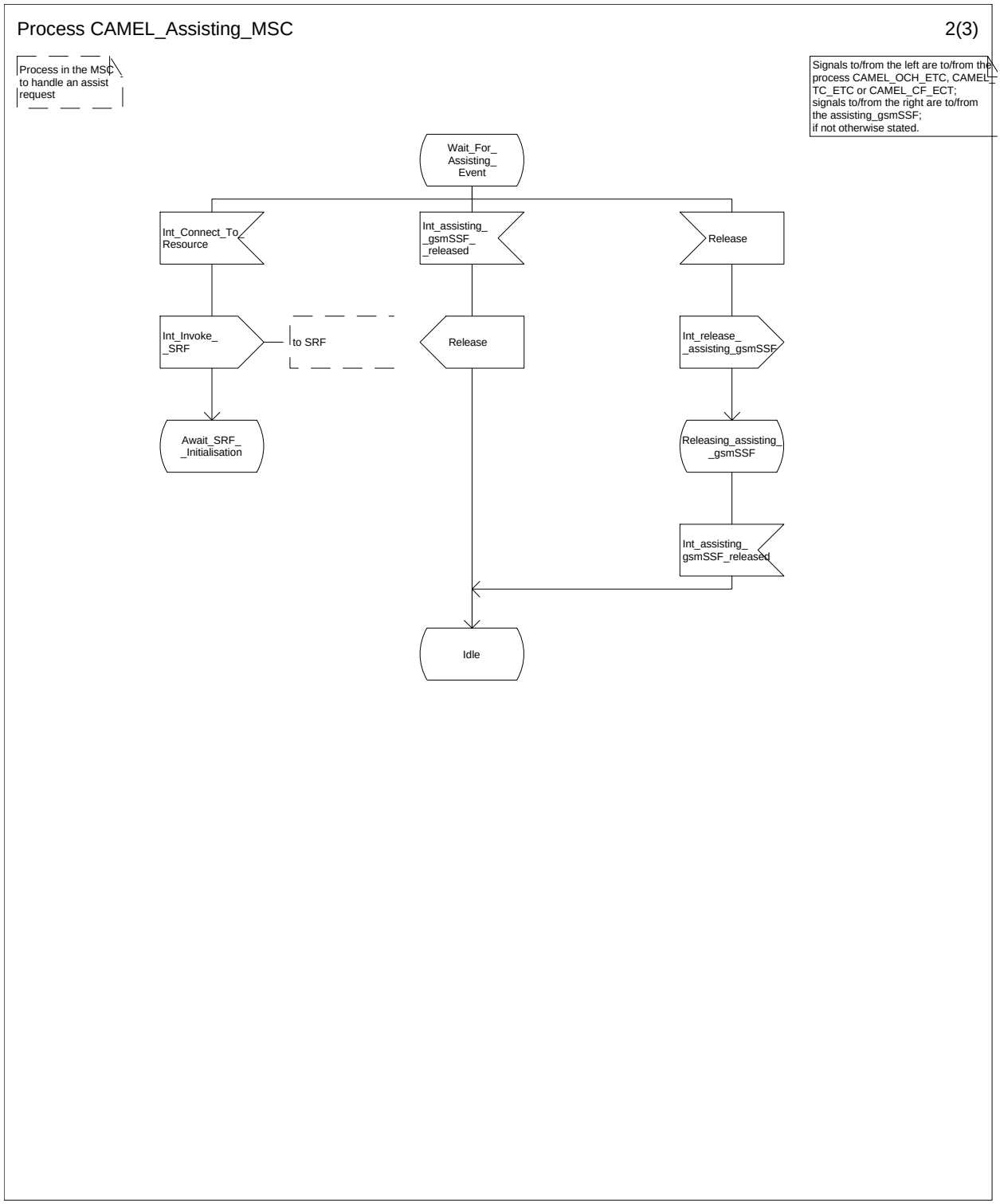

Figure 53b: Process CAMEL_Assisting_MSC (sheet 2)

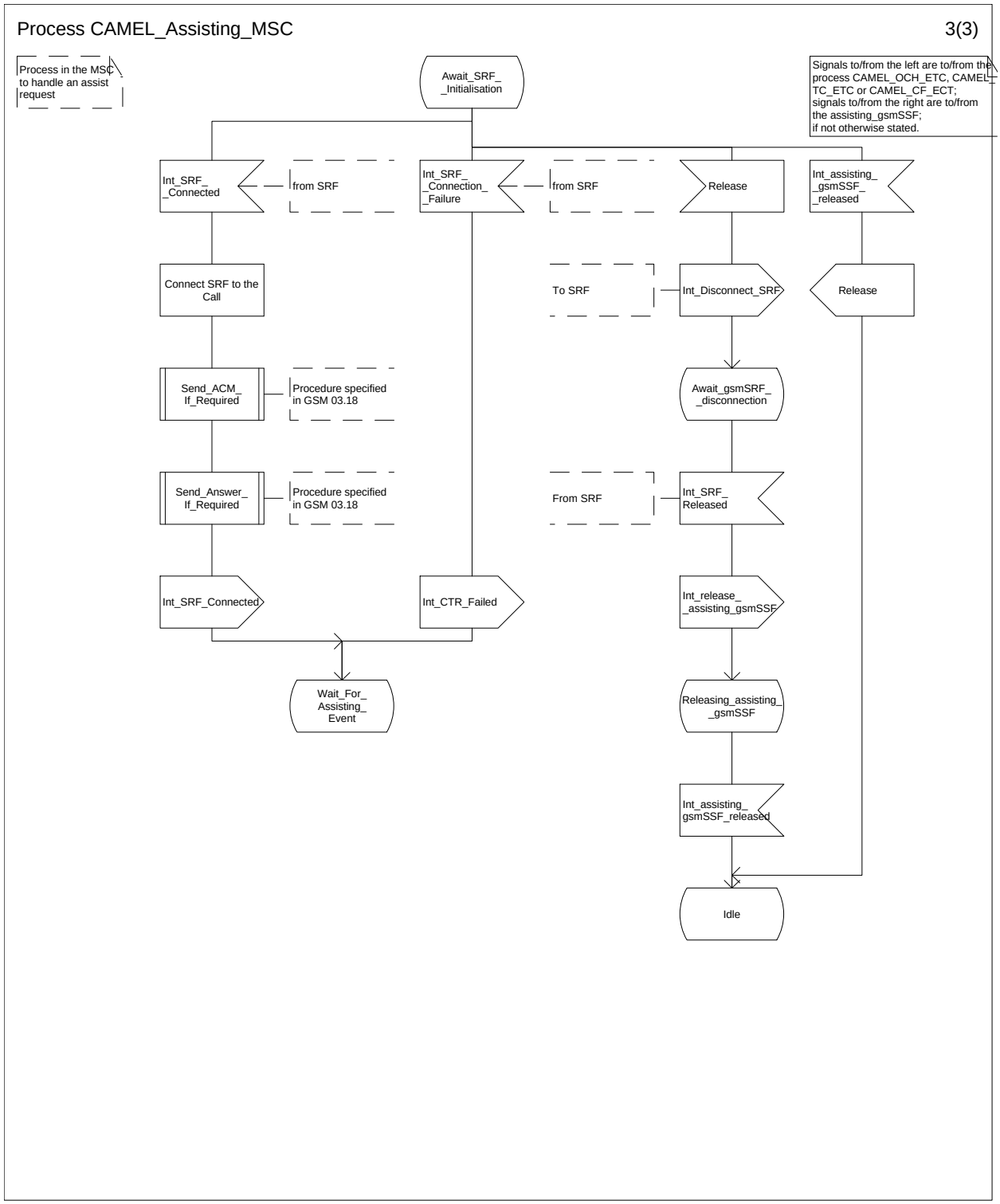

Figure 53c: Process CAMEL_Assisting_MSC (sheet 3)

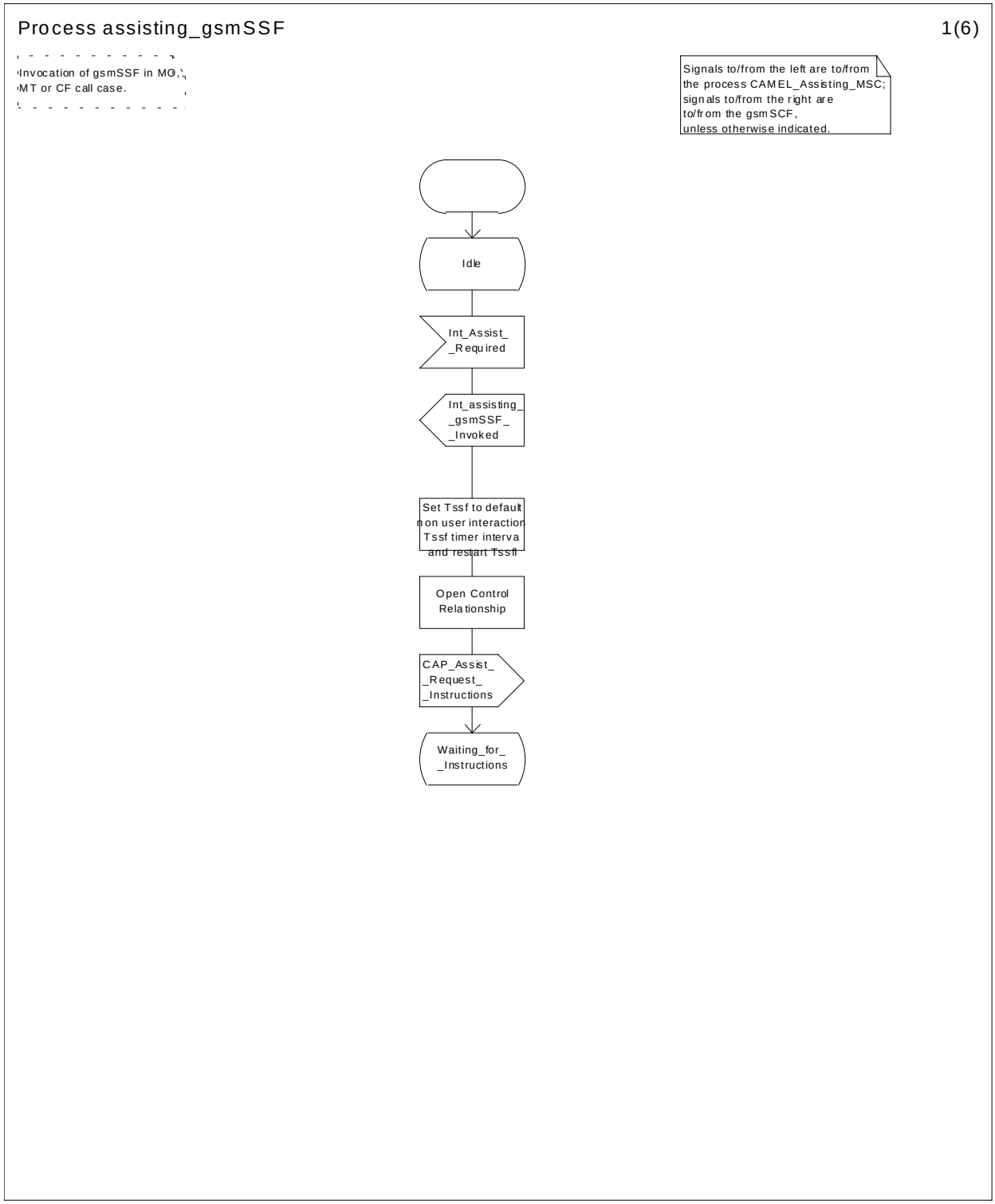

Figure 54a: Process Assisting_gsmSSF (sheet 1)

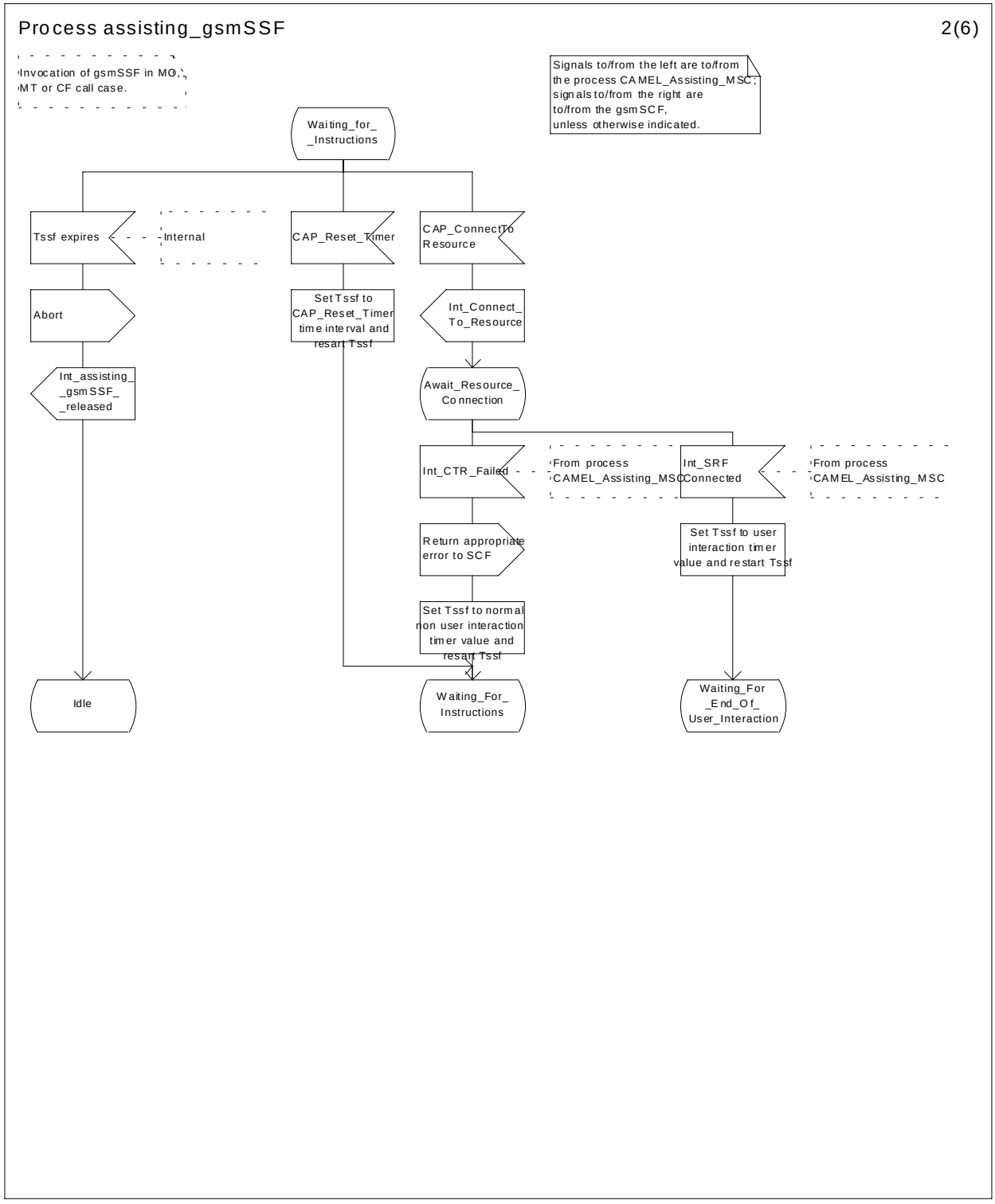

Figure 54b: Process Assisting_gsmSSF (sheet 2)

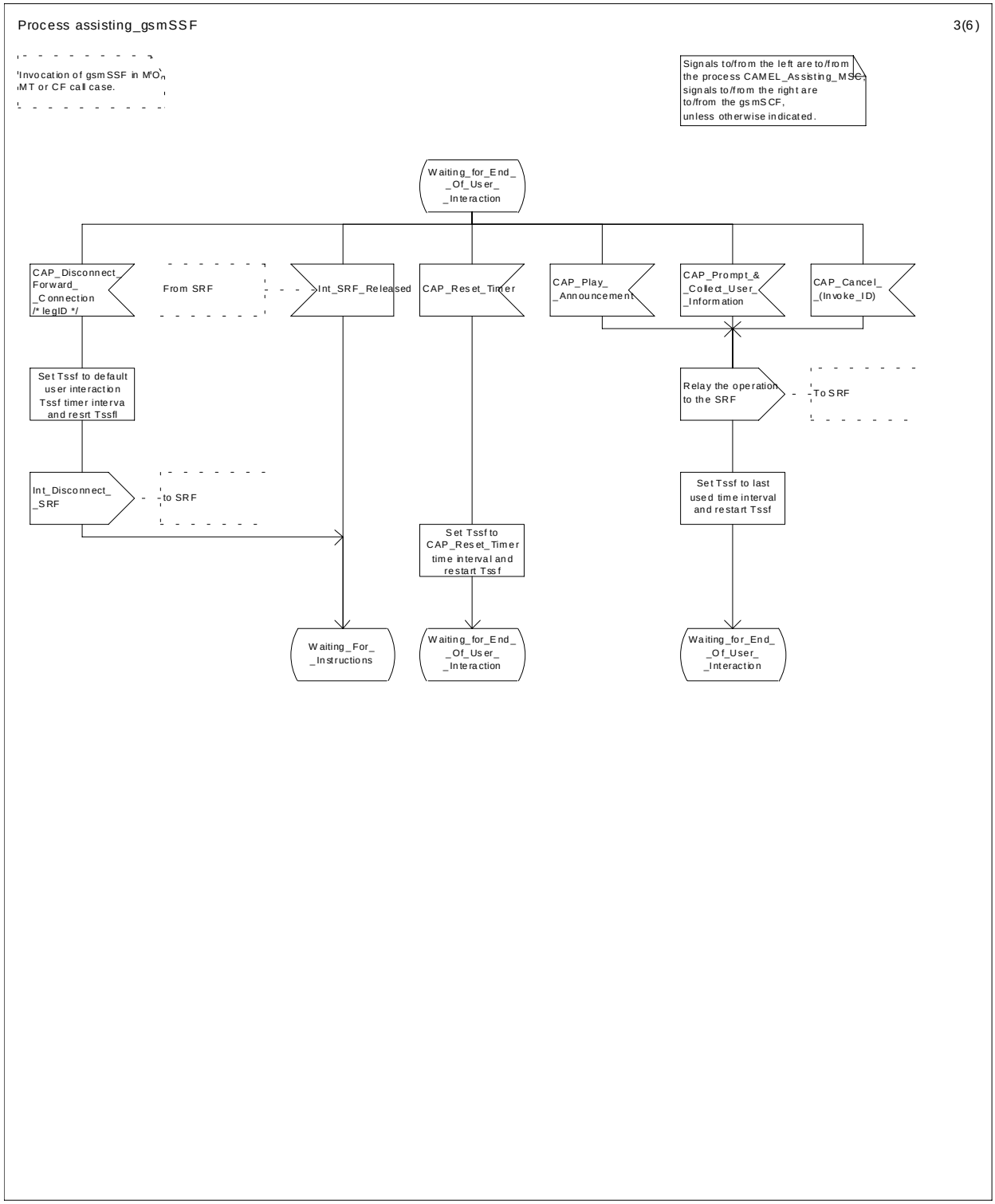

Figure 54c: Process Assisting_gsmSSF (sheet 3)

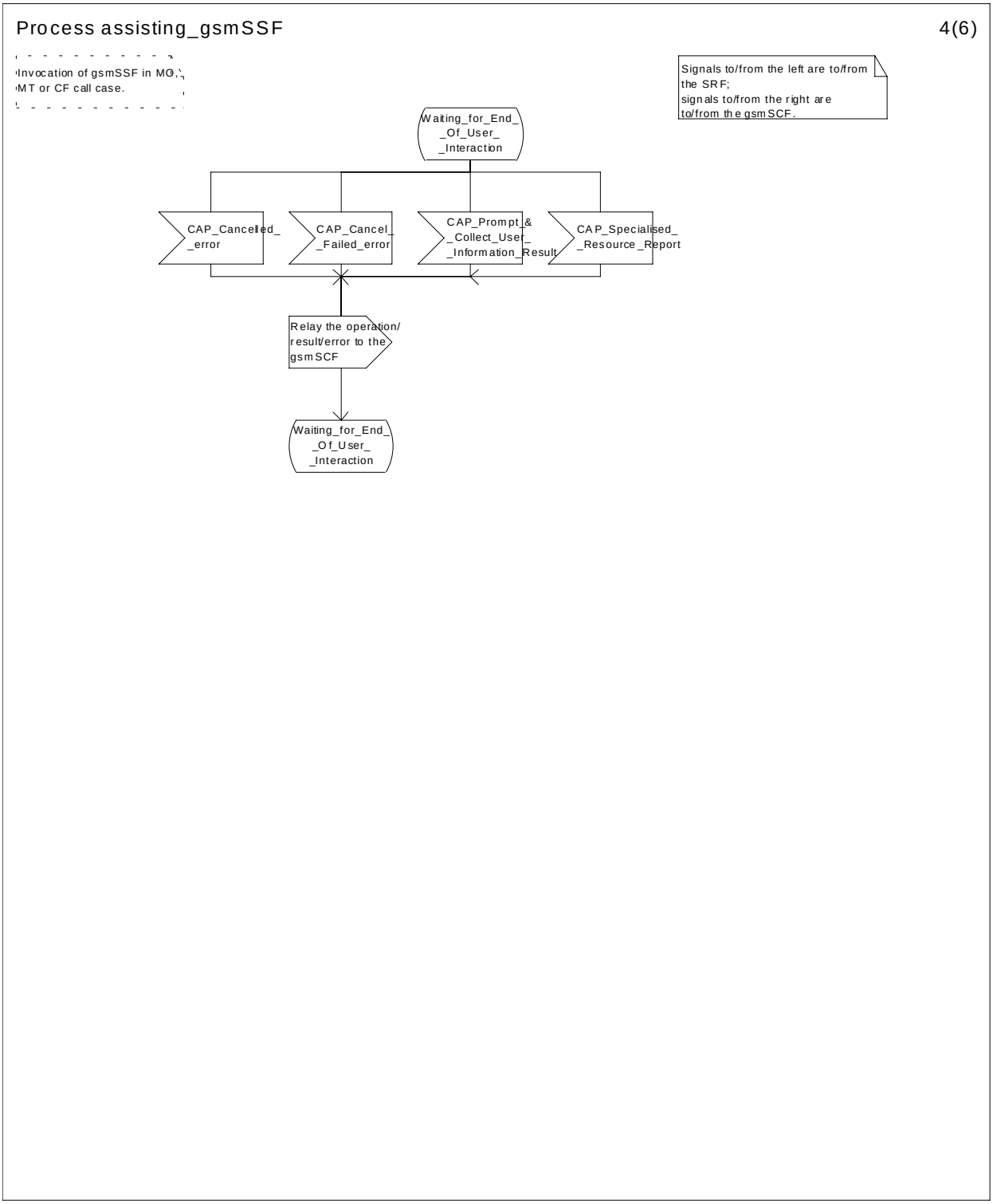

Figure 54d: Process Assisting_gsmSSF (sheet 4)

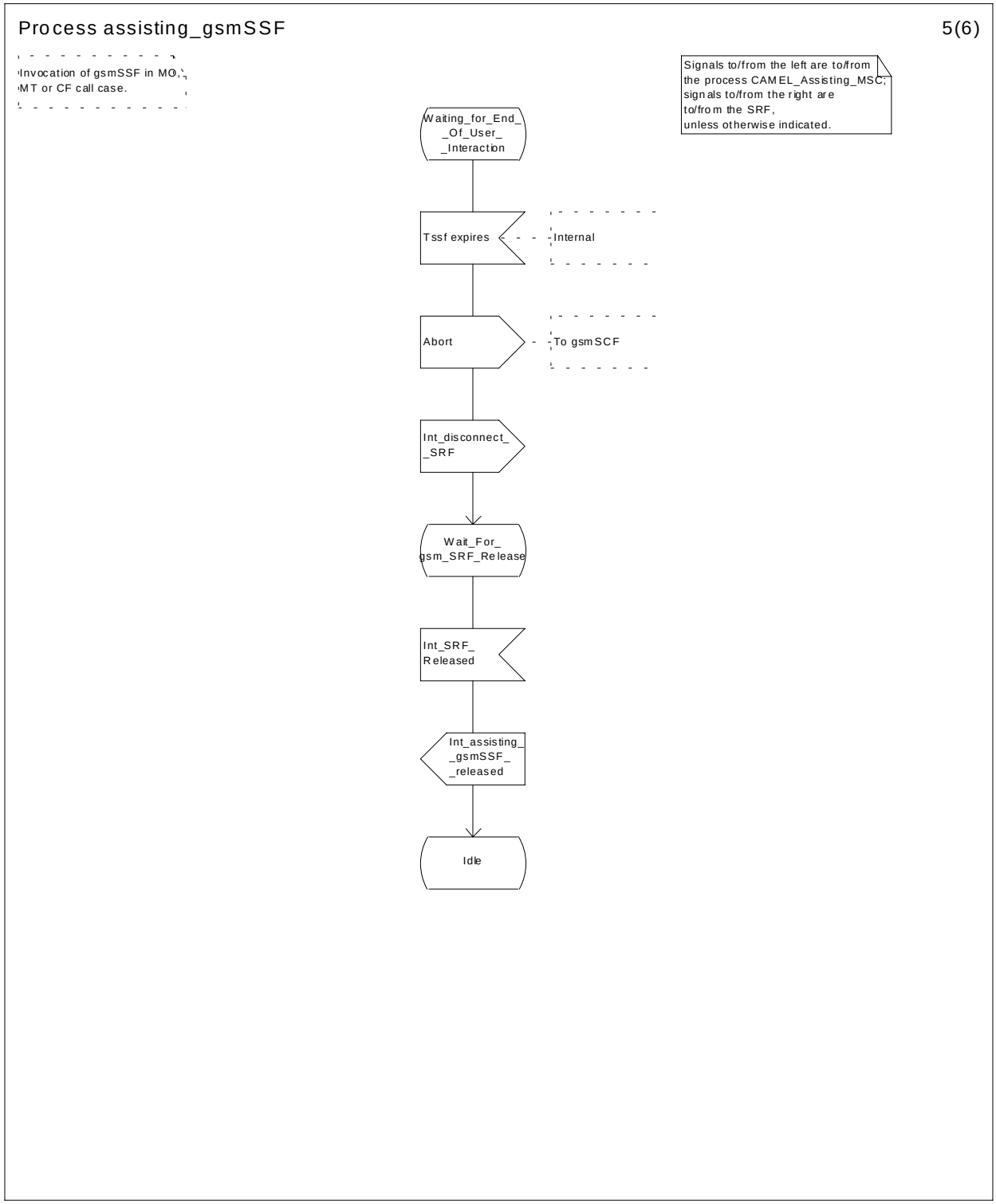

Figure 54e: Process Assisting_gsmSSF (sheet 5)

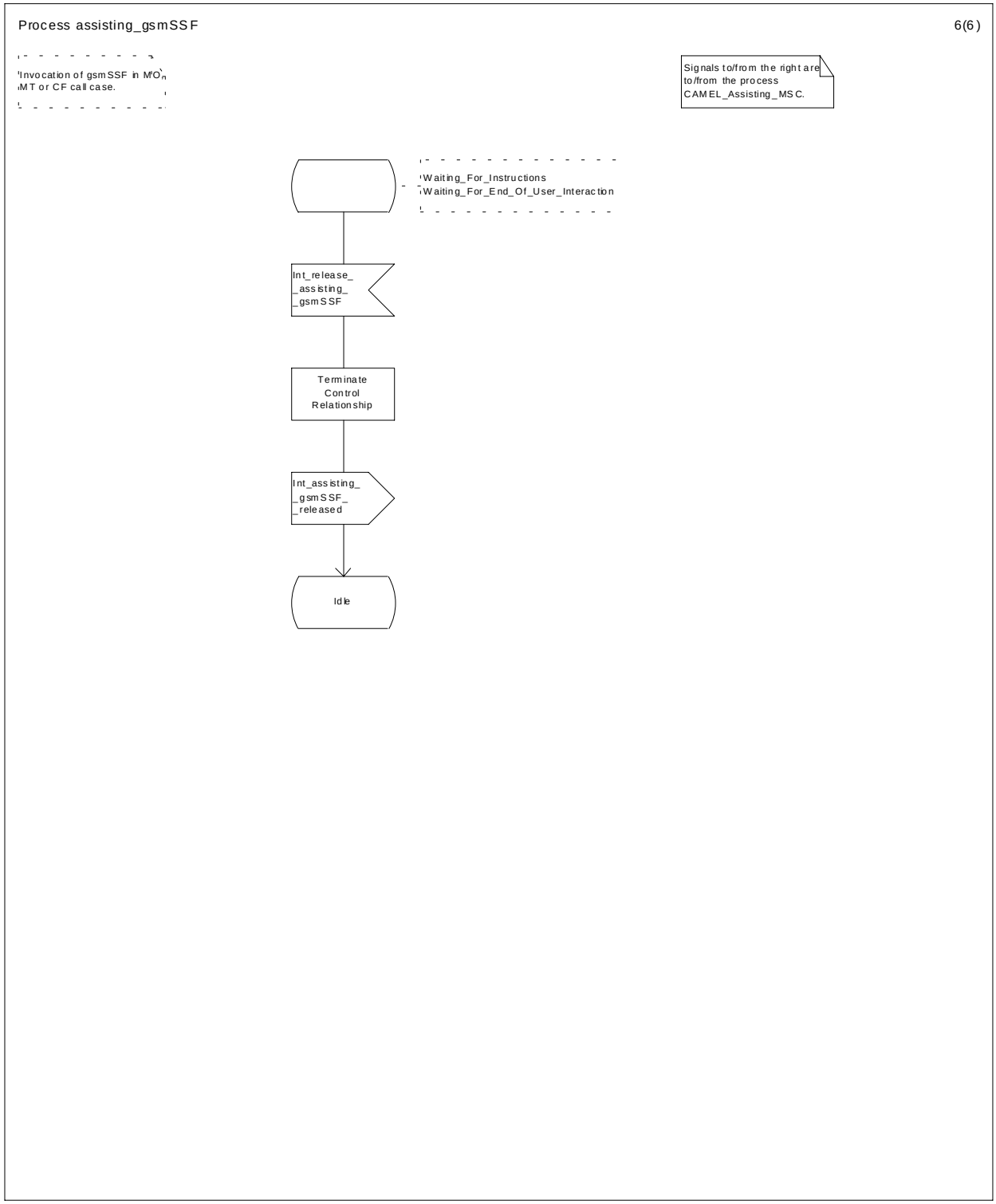

Figure 54f: Process Assisting_gsmSSF (sheet 6)

8.8 Procedure CAMEL_Provide_Subscriber_Info

8.8.1 MS reachable

A Provide_Subscriber_Info Request is sent to VLR and the HLR waits in state Wait_For_Information.

If the VLR returns a Provide_Subscriber_Info ack, the HLR uses the returned information to set the Subscriber Info to be returned to the gsmSCF. As a network option, the HLR may use the returned Cell Id or Location Area to derive the location number and/or Geographical Info. The mapping from cell ID and location area to location number is network-specific and outside the scope of the GSM standard.

NOTE: The handling in the VLR of Provide_Subscriber_Info Request is defined in 3GPP TS 03.18 [3].

8.8.2 MS not reachable

8.8.2.1 Location Information requested

If VLR number is available in the HLR, then the Location Information is set to this parameter only.

If location information is not available in the HLR, no location information is set.

8.8.2.2 Subscriber State requested

The Subscriber State is set to "Network determined not reachable".

8.8.3 Actions at state Wait_For_Information

The following actions are possible in state Wait_For_Information depending on the result of the Provide_Subscriber_Info Request sent to VLR.

8.8.3.1 Provide_Subscriber_Info ack

The Location Information or/and the Subscriber State are set to the received information.

8.8.3.2 Provide_Subscriber_Info Negative Response

If location information was requested the VLR number is provided as location information. If the subscriber state was requested the subscriber state is set to "not provided from VLR".

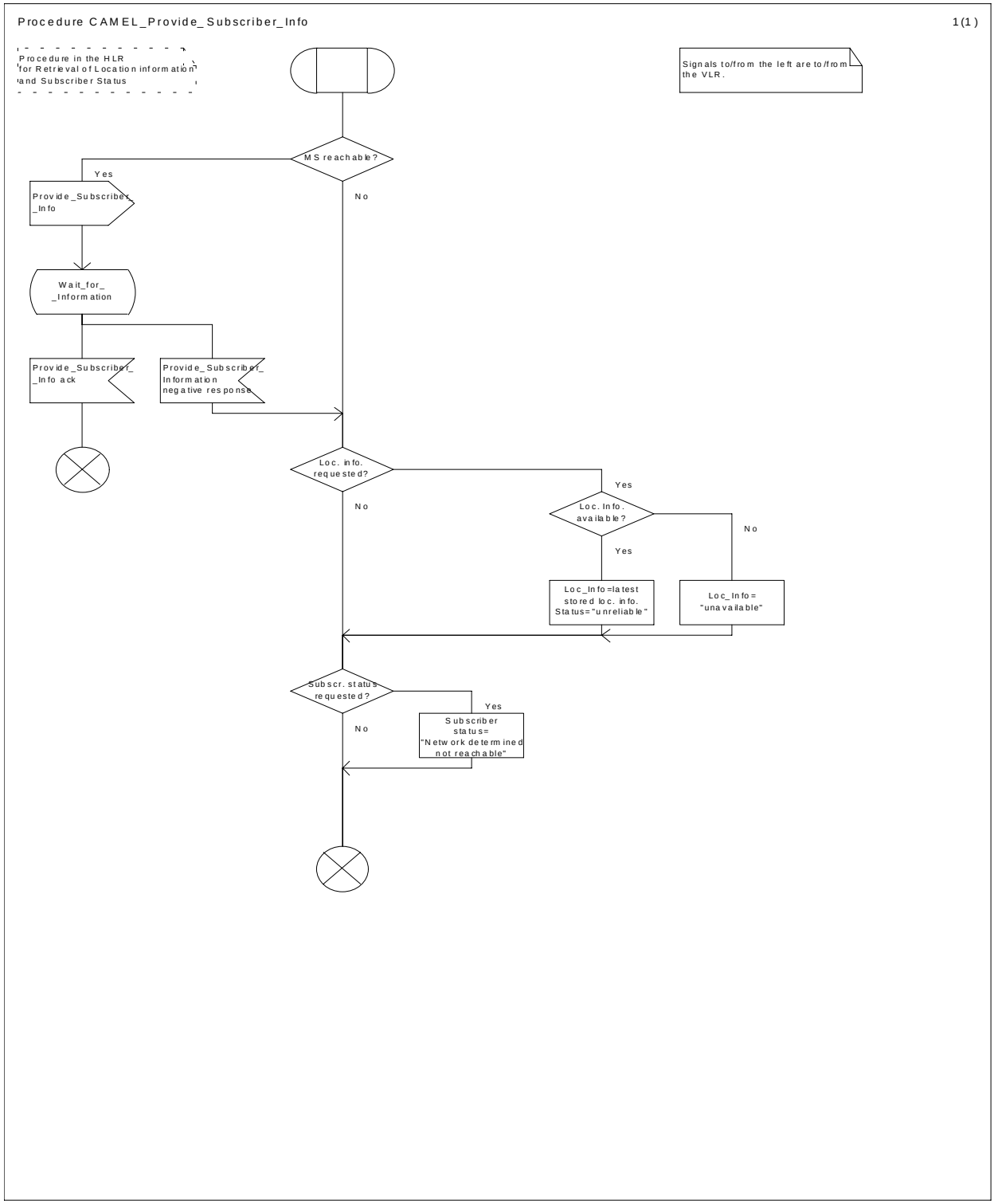

Figure 55a: Procedure CAMEL_Provide_Subscriber_Info (sheet 1)

8.9 Any Time Interrogation

Handling of Any Time Interrogation involves the following process :

- CAMEL_ATI_HLR.

If an OSS needs the Subscriber State and/or the Location Information, the gsmSCF initiates a transaction to the HLR by sending a Any_Time_Interrogation Request. Support for this procedure is a network operator option.

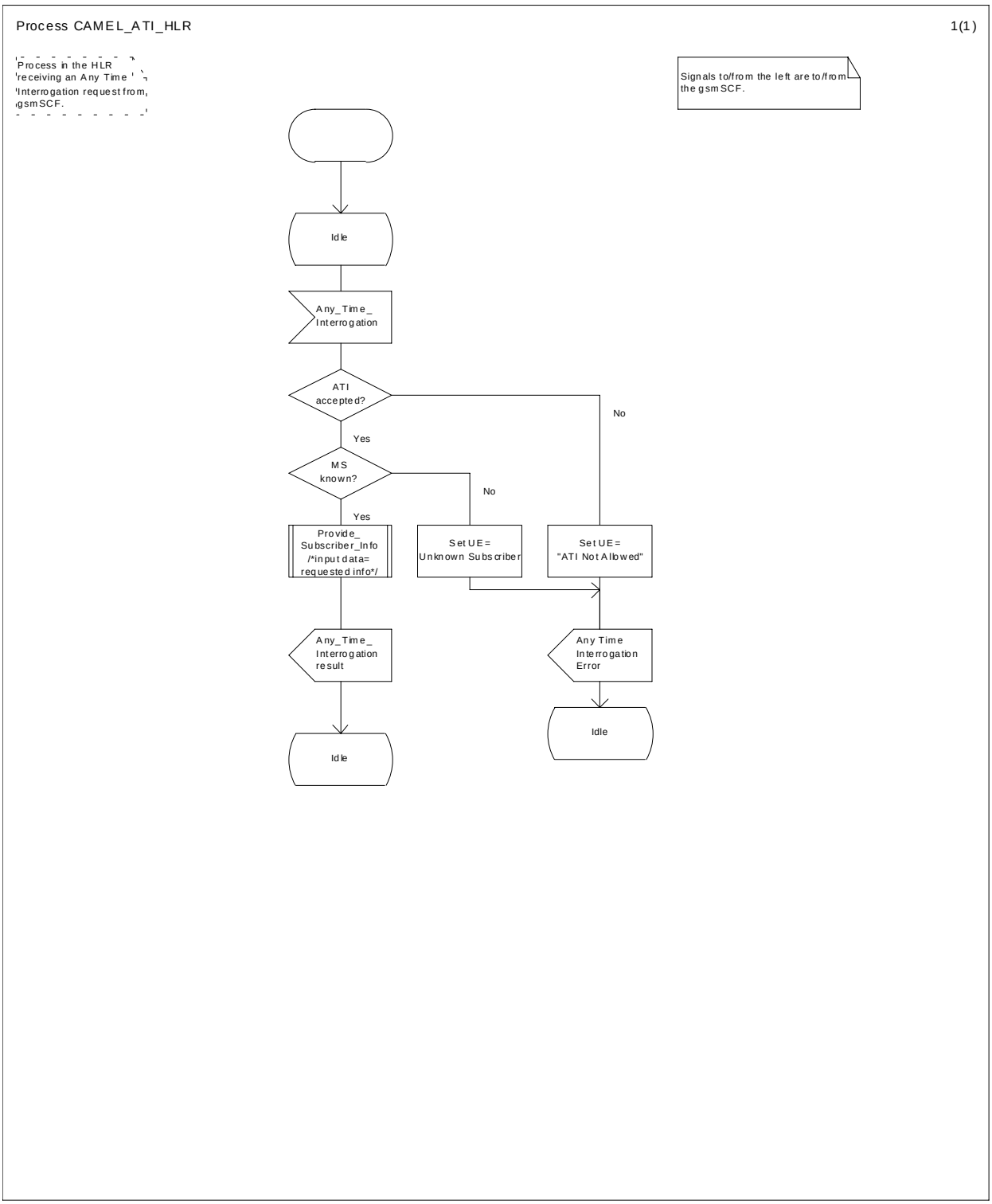

Figure 56a: Process CAMEL_ATI_HLR (sheet 1)

8.10 Handling of USSD to/from gsmSCF

The functional model of USSD in an HLR that supports CAMEL is shown in figure 57. The phase 2 USSD handler is defined in 3GPP TS 03.90 [8]. Phase 1 USSD messages may be relayed from the HLR to the gsmSCF. CAMEL introduces a "CAMEL USSD application" which is invoked by the USSD handler. The CAMEL USSD application behaviour is specified in this section.

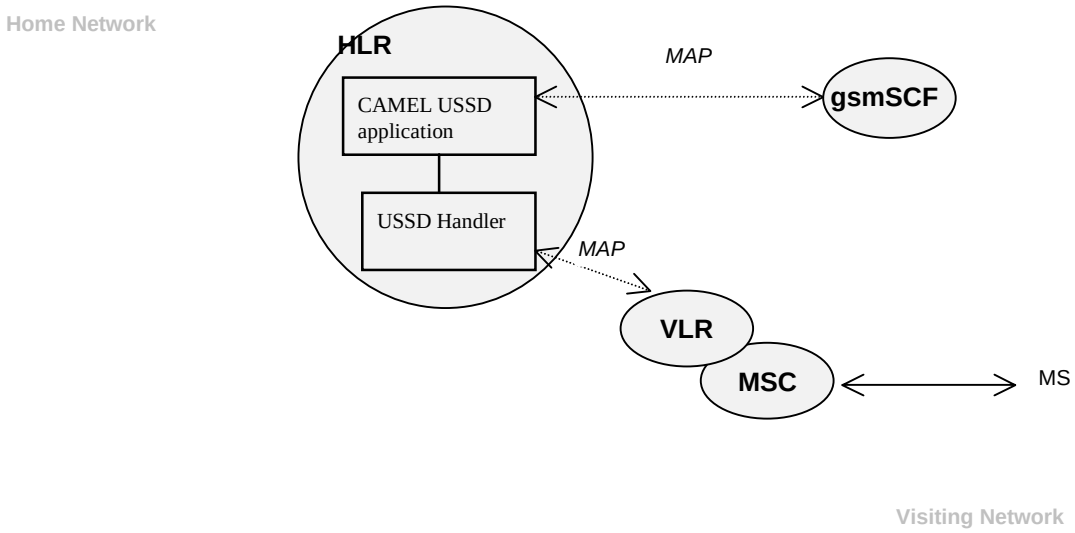

Figure 57: Handling of USSD to and from a CAMEL subscriber

8.10.1 MS Initiated USSD

For the behaviour of the USSD handler in HLR when receiving a MS initiated USSD see 3GPP TS 03.90 [8].

When the USSD handler has determined that the service code present in the received USSD does not indicate that an USSD application in the HLR shall be invoked it shall route the USSD to the USSD application specific for CAMEL, i.e. the CAMEL USSD application.

The procedure at the CAMEL USSD application at the HLR is implementation dependent. The following text describes a recommended procedure.

The CAMEL USSD application shall check the U-CSI data assigned to the specific subscriber. If the service code is present in the U-CSI the USSD is routed to the gsmSCF given by the gsmSCF address stored against the service code in the U-CSI.

If the service code is not present in the U-CSI (or the subscriber does not have U-CSI defined) then the CAMEL USSD application shall check the UG-CSI data assigned to the HLR. If the service code is present in the UG-CSI then the USSD is routed to the gsmSCF given by the gsmSCF address stored against the service code in the UG-CSI.

If the service code is not present in U-CSI or UG-CSI an error (unknown application) is returned to the USSD handler.

8.10.2 gsmSCF Initiated USSD

The HLR may at any time receive a USSD operation from the gsmSCF. If the subscriber can be contacted, the HLR shall set up a transaction to the VLR and forward the operation unchanged. Any further information exchange between the gsmSCF and MSC shall be transparent to the VLR and the HLR. When one transaction is released, the HLR shall release the other. If an error is received from the MSC, the VLR shall release the transaction to the HLR and the HLR shall release the transaction to the gsmSCF.

8.10.3 Content of the USSD General CAMEL Service Information (UG-CSI)

The service information specified in this subclause is for information only.

This subclause defines the contents of the USSD General CAMEL Service Information (UG-CSI). The allocation of the UG-CSI is independent from a particular subscriber.

The UG-CSI consists of a list of pairs of the following two parameters.

8.10.3.1 Service Code

Service code for a specific application in a gsmSCF which interacts with the user by USSD.

8.10.3.2 gsmSCF address

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

8.11 Handling of Supplementary Service Invocation Notification

At the invocation of either of the services ECT and MPTY the VLR checks whether the criteria for sending a notification are fulfilled, i.e. whether the subscriber is provisioned with the SS-CSI and the particular invoked supplementary service is marked in the SS-CSI. If this is the case a notification is sent to the gsmSCF given by the gsmSCF address contained in the SS-CSI. The processing of the particular SS invocation is not suspended. If the notification criteria are not fulfilled the processing of the particular supplementary service continues unchanged and no notification is sent.

The sending of the notification is independent of call related CAMEL processing, i.e. processing indicated by O/T-CSI.

On invocation of ECT, the VLR shall include the SS-CSI in the Invoke ECT response message (see Process MAF027 in 3GPP TS 03.91 [12].) to the MSC if applicable for ECT.

On invocation of MPTY, the VLR shall include the SS-CSI in the Process MPTY message (see Process MPTY_MAF026 in 3GPP TS 03.84 [11]) to the MSC if applicable for MPTY.

8.12 CAMEL specific handling of location updating and data restoration

When requesting location updating or data restoration the VLR shall indicate to the HLR which CAMEL phases it supports.

The CAMEL phase 2 HLR shall then send to the VLR CAMEL subscription data for one of the CAMEL phases supported by the VLR or, if some different handling is required, data for substitute handling.

8.13 Processing of Non-Call Related Events

CAMEL does not modify any of the standardized procedures for non-call related events including:

- call independent supplementary service procedures;
- transfer of SMS messages;
- mobility management procedures.

8.14 Cross phase compatibility

To avoid a case by case fallback between the gsmSSF and the gsmSCF, the gsmSSF shall use the CAP phase corresponding to the CAMEL phase negotiated on the HLR-VLR interface when it opens a dialogue with the gsmSCF. The HLR-VLR negotiation of CAMEL phase is per subscriber.

8.15 Handling of North American Carrier Information

The following procedures apply normally only when the HPLMN of the CAMEL subscriber and either the VPLMN (for a mobile originated or forwarded call) or the IPLMN (for a mobile terminated or forwarded call) are both North American. As an option, the procedures may also be applied for a mobile originated or forwarded call at a North American VPLMN when the HPLMN of the CAMEL subscriber is not North American. A gsmSCF may then provide the gsmSSF with any of the following North American (NA) carrier related information items.

- NA Carrier Information,
- NA Originating Line Information,
- NA Charge NumberA gsmSSF shall use the received information items both to select any long distance carrier needed for the call and to provide certain information needed by this carrier. Any required information items not received shall be defaulted to those that would normally apply to the call in the absence of an interaction with a gsmSCF.

If any NA information item received from the gsmSCF is found to be invalid, the gsmSSF may either, as an operator option, release the call or behave as if the invalid information item had not been sent.

If the carrier specified in the NA Carrier Information parameter is not supported in the VPLMN or IPLMN, the gsmSSF may either, as an operator option, release the call or substitute for the unsupported carrier a preferred carrier of the VPLMN or IPLMN.

Support of the NA Originating Line Information and NA Charge Number parameters is an operator option in a VPLMN based on roaming agreements with the operators of other PLMNs, A gsmSSF may ignore these items when received from certain or all gsmSCFs located in other PLMNs and replace them with the corresponding default items for an MO, MF or MT call.

9 Description of information flows

This clause contains the detailed description of the information flows used by CAMEL.

Each Information Element, IE is marked as Mandatory, Conditional, Optional or Not applicable for each different traffic case, Mobile Originating call (MO), Mobile Forwarded call (MF) and Mobile Terminating call (MT). This categorisation is a functional classification, i.e., stage 2 information and 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 gsmSSF shall functionally support all IEs which can be sent to it.
- The gsmSCF may silently discard any IE which it does not functionally support
- The gsmSRF shall return an error if it does not functionally support a IE which it receives.
- The HLR may silently discard any IE which it does not functionally support.

Details of errors and exceptions to these rules are specified in are specified in 3GPP TS 09.78 [5].

9.1 gsmSSF to gsmSCF information flows

9.1.1 Activity Test ack

9.1.1.1 Description

This IF is the response to the Activity Test.

9.1.1.2 Information Elements

This IF contains no information elements.

9.1.2 Apply Charging Report

9.1.2.1 Description

This IF is used by the gsmSSF to report to the gsmSCF the information requested in the Apply Charging IF.

9.1.2.2 Information Elements

Information element name	MO	MF	MT	Description
Call Result	M	M	M	This IE contains the charging information to be provided by the gsmSSF.

M Mandatory (The IE shall always be sent)

Call Result contains the following information:

Information element name	MO	MF	MT	Description
Time Duration Charging Result	M	M	M	This IE is a list defined in the next table.

M Mandatory (The IE shall always be sent)

Time Duration Charging Result contains the following information:

Information element name	MO	MF	MT	Description
Time Information	M	M	M	This IE is a choice between Time if No Tariff Switch and Time if Tariff Switch.
Party To Charge	M	M	M	This IE is received in the related ApplyCharging operation to correlate the result to the request. This IE shall be a copy of the corresponding IE received in the Apply Charging operation.
Call Active	M	M	M	This IE indicates whether the call is active or not.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

Time Information contains one of the following information:

Information element name	MO	MF	MT	Description
Time If No Tariff Switch	C	C	C	This IE will be present if no tariff switch has occurred since the detection of Answer for the connection to the Called Party, the Temporary Connection, or the SRF connection, otherwise it will be absent.
Time If Tariff Switch	C	C	C	This IE will be present if a tariff switch has occurred since the detection of Answer for the connection to the Called Party, the Temporary Connection, or the SRF connection, otherwise it will be absent.

C Conditional (The IE shall be sent, if available)

9.1.3 Call Information Report

9.1.3.1 Description

This IF is used to send specific call information for a single call to the gsmSCF as requested from the gsmSCF in a previous Call Information Request.

9.1.3.2 Information Elements

Information element name	MO	MF	MT	Description
Requested Information List	M	M	M	This IE specifies a list of Requested information Values which are requested.
Leg ID	M	M	M	This IE indicates the party in the call for which information shall be collected. When absent, it indicates the 'outgoing' leg created with Connect or Continue.

M Mandatory (The IE shall always be sent)

9.1.4 Event Report BCSM

9.1.4.1 Description

This IF is used to notify the gsmSCF of a call-related event (i.e., BCSM events as answer and disconnect) previously requested by the gsmSCF in a Request Report BCSM Event IF.

9.1.4.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Event type BCSM	M	M	M	This IE specifies the type of event that is reported.
Event Specific Information BCSM	C	C	C	This IE indicates the call related information specific to the event.
Leg ID	M	M	M	This IE indicates the party in the call for which the event is reported.
Misc Call Info	M	M	M	This IE indicates the DP type.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

9.1.5 Initial DP

9.1.5.1 Description

This IF is generated by the gsmSSF when a trigger is detected at a DP in the BCSM, to request instructions from the gsmSCF.

9.1.5.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Additional Calling Party Number	-	C	C	The calling party number provided by the access signalling system of the calling user.
Bearer Capability	M	C	C	This IE indicates the type of the bearer capability connection to the user.
Called Party Number	-	M	M	This IE contains the number used to identify the called party in the forward direction.
Called Party BCD Number	M	-	-	This IE contains the number used to identify the called party in the forward direction. The number contained in this IE shall be identical to the number received over the access network. It may e.g. include service selection information, such as ∗ and # digits, or carrier selection information dialled by the subscriber.
Calling Party Number	M	C	C	This IE carries the calling party number to identify the calling party or the origin of the call.
Calling Partys Category	M	C	C	Indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).

(continued)

(concluded)

Information element name	MO	MF	MT	Description
Call Reference Number	M	M	M	This IE may be used by the gsmSCF for inclusion in a network optional gsmSCF call record. It has to be coupled with the identity of the MSC which allocated it in order to define unambiguously the identity of the call. For MO calls, the call reference number is set by the serving VMSC and included in the MO call record. For MT calls, the call reference number is set by the GMSC and included in the RCF call record in the GMSC and in the MT call record in the terminating MSC. For CF calls, the call reference number is set by the GMSC and included in the CF record in the forwarding MSC.
Event Type BCSM	M	M	M	This IE indicates the armed BCSM DP event (i.e., Collected_Info and Terminating_Attempt_Authorised), resulting in the Initial DP IF.
Ext-Basic Service Code	C	C	C	This IE indicates the type of basic service i.e., teleservice or bearer service.
High Layer Compatibility	C	C	C	This IE indicates the type of the high layer compatibility, which will be used to determine the ISDN-teleservice of a connected ISDN terminal.
IMSI	M	M	M	This IE identifies the mobile subscriber.
IP SSP Capabilities	C	C	C	This IE indicates which SRF resources are supported within the gsmSSF and are available. If this IE is absent, this indicates that no gsmSRF is attached and available.
Location Information	M	-	C	This IE is described in the next table.
Location Number	M	C	C	For mobile originated calls this IE represents the location of the calling party. For all other call scenarios this IE contains the location number received in incoming ISUP signalling.
MSC Address	M	M	M	For MO calls, the MSC Address carries the international E.164 address of the serving VMSC. For MT calls, the MSC Address Address carries the international E.164 address of the GMSC. For CF calls, the MSC Address carries the international E.164 address of the forwarding MSC.
GMSC Address	-	M	-	For CF calls, the GMSC Address carries the international E.164 address of the GMSC.

(continued)

(concluded)

Information element name	MO	MF	MT	Description
NA Carrier Information	C	C	C	The content of this IE is described in the next table. The IE may normally be sent when the VPLMN and the HPLMN of the subscriber are both North American. For MO calls, this IE shall contain any carrier that was dialed by the calling subscriber. If no carrier was dialed, the IE shall contain the calling subscriber's subscribed carrier. For MT calls, the IE shall contain the carrier subscribed to by the called subscriber.For MF calls, the IE shall contain the carrier subscribed to by the forwarding subscriber.
Original Called Party ID	-	C	C	This IE carries the dialled digits if the call has met call forwarding on the route to the gsmSSF.
Redirecting Party ID	-	M	C	This IE indicates the directory number the call was redirected from.
Redirection Information	-	M	C	It contains forwarding related information, such as redirection counter.
Service Key	M	M	M	This IE identifies for the gsmSCF the requested set of one or more CAMEL services. It is used to address the correct application/SLP within the gsmSCF.
Subscriber State	-	-	C	This IE indicates the status of the MS. The states are: - CAMELBusy: The MS is engaged on a transaction for a mobile originating or terminated circuit-switched call. - NetworkDeterminedNotReachable: The network can determine from its internal data that the MS is not reachable. - AssumedIdle: The state of the MS is neither "CAMELBusy" nor "NetworkDeterminedNotReachable". - Not provided from VLR.
Time And Timezone	M	M	M	This IE contains the time that the gsmSSF was triggered, and the time zone the gsmSSF resides in.
GSM Forwarding Pending	-	-	C	This parameter indicates that a forwarded-to-number was received and the call will be forwarded due to GSM supplementary service call forwarding in the GMSC.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

- Not applicable

Location Information contains the following information:

Information element name	MO	MF	MT	Description
Location Number	-	-	C	See 3GPP TS 03.18 [3].
CellIdOrLAI	M	-	C	See 3GPP TS 03.18 [3].
Geographical Information	C	-	C	See 3GPP TS 03.18 [3].
Age Of Location Information	M	-	C	See 3GPP TS 03.18 [3].
VLR number	M	-	C	See 3GPP TS 03.18 [3].

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if available)

- Not applicable

NA Carrier Information contains the following information:

Information element name	MO	MF	MT	Description
NA Carrier Identification Code	M	M	M	This IE uniquely identifies a North American long distance carrier.
NA Carrier Selection Information	M	M	M	This IE indicates the way the carrier was selected e.g.: – dialled – subscribed

M Mandatory (The IE shall always be sent)

9.2 gsmSCF to gsmSSF information flows

9.2.1 Activity Test

9.2.1.1 Description

This IF is used to check for the continued existence of a relationship between the gsmSCF and gsmSSF. If the relationship is still in existence, then the gsmSSF will respond. If no reply is received, then the gsmSCF will assume that the gsmSSF has failed in some way and will take the appropriate action.

9.2.1.2 Information Elements

This IF contains no information elements.

9.2.2 Apply Charging

9.2.2.1 Description

This IF is used for interacting from the gsmSCF with the gsmSSF charging mechanisms to control the call duration.

9.2.2.2 Information Elements

Information element name	MO	MF	MT	Description
ACh Billing Charging Characteristics	M	M	M	This IE specifies the charging related information to be provided by the gsmSSF and the conditions on which this information has to be provided back to the gsmSCF.
Party To Charge	M	M	M	This IE shall be reflected in the corresponding IE of the Apply Charging Report operation. This IE has no effect on the charging procedures in the MSC.

M Mandatory (The IE shall always be sent)

ACh Billing Charging Characteristics contains the following information:

Information element name	MO	MF	MT	Description
Time Duration Charging	M	M	M	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

Time Duration Charging contains the following information:

Information element name	MO	MF	MT	Description
Max Call Period Duration	M	M	M	This IE indicates the maximum call period duration timer.
Tariff Switch Interval	O	O	O	This IE indicates the tariff switch time until the next tariff switch applies.
Release If Duration Exceeded	O	O	O	This IE indicates that the call shall be released when the Max call Period Duration expires, with a warning tone if the Play Tone IE is present. The cause used in the release message shall be "normal unspecified". Default is to continue the call.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

Release If Duration Exceeded contains the following IE :

Information element name	MO	MF	MT	Description
Play Tone	O	-	O	This IE is set if a tone has to be played to the party for whom the BCSM is operating. If present, this IE indicates that 30 seconds before the Max Call Period Duration timer expires, a triple tone of 900 Hz (200 milliseconds tone, 200 milliseconds pause) shall be played. This IE shall be absent if the call is not to be released.

O Optional (Service logic dependant)

- Not applicable

9.2.3 Call Information Request

9.2.3.1 Description

This IF is used to request the gsmSSF to record specific information about a single call and report it to the gsmSCF (with a CallInformationReport)

9.2.3.2 Information Elements

Information element name	MO	MF	MT	Description
Requested Information Type List	M	M	M	This IE specifies a list of specific items of information which are requested.
Leg ID	M	M	M	This IE indicates the party in the call for which information shall be collected. When absent, it indicates the 'outgoing' leg created with Connect or Continue.

M Mandatory (The IE shall always be sent)

Requested Information Type List contains the following information:

Information element name	MO	MF	MT	Description
Call Attempt Elapsed Time	O	O	O	This IE indicates that the Call Attempt Elapsed Time is requested in the Call Information Report. Call Attempt Elapsed Time is the duration between the end of the CAMEL processing initiating call setup (Connect or Continue IF) and the received answer indication from the called party side. For the Calling Party, the value of Call Attempt Elapsed Time in the Call Information Report shall be set to 0.
Call Stop Time	O	O	O	This parameter indicates that the Call Stop Time is requested in the Call Information Report. Call Connected Elapsed Time is the time stamp when the connection is released.
Call Connected Elapsed Time	O	O	O	This parameter indicates that the Call Connected Elapsed Time is requested in the Call Information Report. Call Connected Elapsed Time is the duration between the received answer indication from the called party side and the release of the connection. For a Calling Party, it indicates the duration between the sending of InitialDP and the release of that party.
Release Cause	O	O	O	This parameter indicates the Release Cause is requested in the Call Information Report. Release Cause is the release cause for the call.

O Optional (Service logic dependent)

9.2.4 Cancel

9.2.4.1 Description

This IF is used by the gsmSCF to request the gsmSSF to cancel all EDPs and reports.

9.2.4.2 Information Elements

The following information elements are used:

Information element name	MO	MF	MT	Description
All Requests	M	M	M	This IE indicates that all active requests for EventReportBCSM, ApplyChargingReport and CallInformationReport shall be cancelled.

M Mandatory (The IE shall always be sent)

9.2.5 Connect

9.2.5.1 Description

This IF is used to request the gsmSSF to perform the call processing actions to route a call to a specific destination. To do so, the gsmSSF may use destination information from the calling party and existing call set-up information depending on the information provided by the gsmSCF.

9.2.5.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Alerting Pattern	-	-	O	This parameter indicates the kind of Alerting Pattern to be applied.
Calling Partys Category	O	O	O	This IE indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).
Destination Routing Address	M	M	M	This IE contains the called party number towards which the call is to be routed.
Generic Number	O	O	O	This IE contains the generic number. Its used to convey the additional calling party number, which e.g. could be used to modify the calling line ID presented to the called user.
NA Carrier Information	O	O	O	This IE is described in the next table.
NA Originating Line Information	O	O	O	This IE identifies the type of number in the NA Charge Number (e.g. subscriber versus PLMN operator number).
NA Charge Number	O	O	O	This IE identifies the chargeable number for the usage of a North American carrier.
O-CSI Applicable	-	-	O	This IE indicates that the O-CSI, if present shall be applied on the outgoing leg.
Original Called Party ID	O	O	O	This IE carries the dialled digits if the call has met call forwarding on route to the gsmSSF or is forwarded by the gsmSCF.
Redirecting Party ID	O	O	O	This IE indicates the directory number the call was redirected from.
Redirection Information	O	O	O	This IE contains forwarding related information, such as redirecting counter.
Suppression Of Announcements	-	-	O	This IE indicates that announcements or tones generated as a result of unsuccessful call setup shall be suppressed.

O Optional (Service logic dependent)

- Not applicable

NA Carrier Information contains the following information:

Information element name	MO	MF	MT	Description
NA Carrier Identification Code	M	M	M	This IE uniquely identifies a North American long distance carrier.
NA Carrier Selection Information	M	M	M	This IE indicates the way the carrier was selected e.g.: – dialled – subscribed

M Mandatory (The IE shall always be sent)

9.2.6 Connect To Resource

9.2.6.1 Description

This IF is used to connect a call from the gsmSSF to a gsmSRF.

9.2.6.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Service Interaction Indicators Two	O	O	O	This parameter indicates whether or not a bothway through connection is required between the Calling party and the gsmSRF. The handling when this IE is not present is defined in EN 301 070-1 ([7]).
Resource Address	O	O	O	This IE indicates the physical location of the gsmSRF.

O Optional (Service logic dependent)

Resource Address contains the following information:

Information element name	MO	MF	MT	Description
IP Routing Address	O	O	O	This IE indicates the routeing address to set up a connection towards the gsmSRF.
None	O	O	O	This parameter indicates that the call party is to be connected to a predefined gsmSRF.

O Optional (Service logic dependent)

9.2.7 Continue

9.2.7.1 Description

This information flow requests the gsmSSF to proceed with call processing at the DP at which it previously suspended call processing to await gsmSCF instructions. The gsmSSF completes DP processing, and continues basic call processing (i.e., proceeds to the next point in call in the BCSM) without substituting new data from the gsmSCF.

9.2.7.2 Information Elements

This IF contains no information elements.

9.2.8 Disconnect Forward Connection

9.2.8.1 Description

This IF is used :

- to disconnect a connection with a gsmSRF previously established with a Connect To Resource IF;
- to disconnect an initiating gsmSSF from an assisting gsmSSF and its associated gsmSRF. The IF is send to the initiating gsmSSF.

9.2.8.2 Information Elements

This IF contains no information elements.

9.2.9 Establish Temporary Connection

9.2.9.1 Description

This IF is used to create a connection between an initiating gsmSSF and an assisting gsmSSF as a part of the assist procedure. It can also be used to create a connection between a gsmSSF and a gsmSRF.

9.2.9.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Assisting SSP IP Routing Address	M	M	M	This parameter indicates the destination address of the gsmSRF or assisting gsmSSF for the assist procedure. As a network operator option, the Assisting SSP IP Routing Address may contain embedded within it, a "Correlation ID" and " Scf ID", but only if "Correlation ID" and "Scf ID" are not specified separately.
Correlation ID	O	O	O	This parameter is used for : - the correlation of dialogues from the initiating gsmSSF-> gsmSCF with dialogues from gsmSRF -> gsmSCF - the correlation of dialogues from the initiating gsmSSF-> gsmSCF with dialogues from assisting gsmSSF -> gsmSCF.
NA Carrier Information	O	O	O	This IE is described in the next table.
NA Originating Line Information	O	O	O	This IE identifies the type of number in the NA Charge Number (e.g. subscriber versus PLMN operator number).
NA Charge Number	O	O	O	This IE identifies the chargeable number for the usage of a North American carrier.
Scf ID	O	O	O	This parameter indicates the gsmSCF identifier
Service Interaction Indicators Two	O	O	O	This parameter indicates whether or not a bothway through connection is required between the Calling party and the gsmSRF. The handling when this IE is not present is defined in EN 301 070-1 ([7]).

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

NA Carrier Information contains the following information:

Information element name	MO	MF	MT	Description
NA Carrier Identification Code	M	M	M	This IE uniquely identifies a North American long distance carrier.
NA Carrier Selection Information	M	M	M	This IE indicates the way the carrier was selected e.g.: – dialled – subscribed

M Mandatory (The IE shall always be sent)

9.2.10 Furnish Charging Information

This IF is used to request the gsmSSF to include call related information in the CAMEL specific logical call record.

9.2.10.1 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
FCI Billing Charging Characteristics	M	M	M	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

FCI Billing Charging Characteristics contains the following information:

Information element name	MO	MF	MT	Description
FCIBCCCAMEL Sequence 1	M	M	M	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

FCIBCCCAMEL Sequence 1 contains the following information:

Information element name	MO	MF	MT	Description
Free Format Data	M	M	M	This IE is a free format data to be inserted in the CAMEL logical call record.
Party To Charge	M	M	M	This IE indicates the party for whom a CAMEL logical call record will be created.

M Mandatory (The IE shall always be sent)

9.2.11 Release Call

9.2.11.1 Description

This IF is used to tear down by the gsmSCF an existing call at any phase of the call for all parties involved in the call.

9.2.11.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Cause	M	M	M	A number giving an indication to the gsmSSF about the reason of releasing this specific call. This may be used by MSC/GMSC for generating specific tones to the different parties in the call or to fill in the "cause" in the release message.

M Mandatory (The IE shall always be sent)

9.2.12 Request Report BCSM Event

9.2.12.1 Description

This IF is used to request the gsmSSF to monitor for a call-related event, then send a notification back to the gsmSCF when the event is detected (see Event Report BCSM).

9.2.12.2 Information Elements

The following information elements are used:

Information element name	MO	MF	MT	Description
BCSM Event	M	M	M	This IE specifies the event or events of which a report is requested.

M Mandatory (The IE shall always be sent)

BCSM Event contains the following information:

Information element name	MO	MF	MT	Description
Event type	M	M	M	This IE specifies the type of event of which a report is requested.
Leg ID	C	C	C	This IE indicates the party in the call for which the event shall be reported.
Monitor Mode	M	M	M	This IE indicates how the event shall be reported.
DP Specific Criteria	O	O	O	This IE is described in the next table.

M Mandatory (The IE shall always be sent)

C Conditional

O Optional (Service logic dependent)

DP Specific Criteria is defined as:

Information element name	MO	MF	MT	Description
Application Timer	O	O	O	This IE carries additional timer duration information (timer values for No Answer event) required for arming No_Answer EDPs in the gsmSSF. The TNRy timer (value defined between 10s and 40s) shall be shorter than the network no answer timer.

O Optional (Service logic dependent)

9.2.13 Reset Timer

9.2.13.1 Description

This IF is used to refresh a timer.

9.2.13.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Timer Value	M	M	M	This IE specifies the value to which the timer Tssf shall be set.
Timer ID	O	O	O	This IE has a default value indicating the Tssf value.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

9.2.14 Send Charging Information

9.2.14.1 Description

This IF is used to send e-parameters from the gsmSCF to the gsmSSF. If charge advice information is received from the gsmSCF, it shall replace the charge advice information which would be generated by the MSC and inhibit any further generation of CAI by the MSC. Further processing of the charge advice information by the MSC shall be in accordance with the GSM Advice of Charge Supplementary Service.

NOTE: If charge advice information is received from the gsmSCF after charge information has been generated by the MSC and sent to the MS, the behaviour of the service may be unpredictable or incorrect ; the service designer should therefore ensure that the first set of charge advice information is sent to the gsmSSF before charge information is sent to the to the MS.

9.2.14.2 Information Elements

The following information elements are only used for the MO case :

Information element name	MO	Description
SCI Billing Charging Characteristics	M	This IE defines the Advice Of Charge related information to be provided to the Mobile Station
Leg ID	M	This IE indicates where the charging information shall be sent.

M Mandatory (The IE shall always be sent)

SCI Billing Charging Characteristics is defined as:

Information element name	MO	Description
AOC After Answer	C	This IE is sent after an Answer from event has been detected from the called party, the current connected SRF or the temporary connection.
AOC Before Answer	C	This IE is sent before an Answer event has been detected from the called party, the current connected SRF or the temporary connection.

C Conditional (only one of these IEs may be sent)

AOC Before Answer is defined as:

Information element name	MO	Description
AOC Initial	M	This IE contains CAI elements as defined in 3GPP TS 02.24 [14].
AOC Subsequent	O	See definition in the next table.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

AOCSubsequent is defined as:

Information element name	MO	Description
CAI Elements	M	This IE contains CAI elements as defined in 3GPP TS 02.24 [14].
Tariff Switch Interval	O	This IE indicates the tariff switch time until the next tariff switch applies.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

AOCAfterAnswer is defined as:

Information element name	MO	Description
CAI Elements	M	This IE contains CAI elements as defined in 3GPP TS 02.24 [14].
Tariff Switch Interval	O	This IE indicates the tariff switch time until the next tariff switch applies.

M Mandatory (The IE shall always be sent)

9.3 Optional (Service logic dependent) gsmSCF to gsmSRF information flows

9.3.1 Cancel

9.3.1.1 Description

This IF is used by the gsmSCF to request the gsmSRF to cancel a correlated previous operation.

9.3.1.2 Information Elements

The following information elements are used:

Information element name	MO	MF	MT	Description
Invoke ID	M	M	M	This IE specifies the operation to be cancelled.

M Mandatory (The IE shall always be sent)

9.3.2 Play Announcement

9.3.2.1 Description

This IF is used for inband interaction.

9.3.2.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Information To Send	M	M	M	This IE indicates an announcement or a tone to be sent to the end user by the gsmSRF.
Disconnect From IP Forbidden	M	M	M	This IE indicates whether or not the gsmSRF may be disconnected from the user when all information has been sent.
Request Announcement Complete	M	M	M	This IE indicates whether or not a SpecializedResourceReport shall be sent to the gsmSCF when all information has been sent.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

Information To Send contains the following information:

Information element name	MO	MF	MT	Description
Inband Info	O	O	O	This IE indicates the inband information to be sent.
Tone	O	O	O	This IE indicates the tone to be sent. The mapping from the code points of this IE to tones is a matter for agreement between the gsmSCF operator and the gsmSRF operator.

O Optional (Service logic dependent)

Inband Info contains the following information:

Information element name	MO	MF	MT	Description
Message ID	M	M	M	This IE is described in the next table.
Number Of Repetitions	M	M	M	This IE indicates the maximum number of times the message shall be sent to the end-user.
Duration	O	O	O	This IE indicates the maximum duration time in seconds that the message shall be played/repeated. Zero indicates endless repetition.
Interval	O	O	O	This IE indicates the time interval in seconds between two repetitions.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

Message ID contains the following information:

Information element name	MO	MF	MT	Description
Elementary Message ID	O	O	O	This IE indicates a single announcement
Text	O	O	O	This IE indicates a text to be sent. The text shall be transformed to inband information (speech) by the gsmSRF.
Elementary Message IDs	O	O	O	This IE indicates a sequence of announcements
Variable Message	O	O	O	This IE indicates an announcement with one or more variable parts.

O Optional (Service logic dependent)

Tone contains the following information:

Information element name	MO	MF	MT	Description
Tone ID	M	M	M	This IE indicates the tone to be sent.
Duration	O	O	O	This IE indicates the maximum duration time in seconds that the message shall be played/repeated. Zero indicates endless repetition.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

9.3.3 Prompt And Collect User Information (received information)

9.3.3.1 Description

This IF is used to interact with a call party in order to collect information.

9.3.3.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Collected Info	M	M	M	This IE is described in the next table.
Information To Send	O	O	O	This IE indicates an announcement or a tone to be sent to the end user by the gsmSRF.
Disconnect From IP Forbidden	O	O	O	This IE indicates whether the gsmSRF should be disconnected from the user when all information has been sent.

O Optional (Service logic dependent)

Collected Info contains the following information:

Information element name	MO	MF	MT	Description
Collected Digits	M	M	M	This IE is described in the next table.

O Optional (Service logic dependent)

Collected Digits contains the following information:

Information element name	MO	MF	MT	Description
Minimum Number Of Digits	M	M	M	This IE indicates the minimum number of valid digits to be collected.
Maximum Number Of Digits	O	O	O	This IE specifies the maximum number of valid digits to be collected
End Of Reply Digit	O	O	O	This IE indicates the digit(s) used to signal the end of input.
Cancel Digit	O	O	O	If this IE is present, the cancel digit can be entered by the user to request a possible retry
Start Digit	O	O	O	If this IE is present, the start digit(s) indicates the start of the valid digits to be collected.
First Digit Time Out	O	O	O	If this IE is present, the first digit shall be received before the expiration of the first digit timer expiration
Inter Digit Time Out	O	O	O	If this IE is present, any subsequent valid or invalid digit shall be received by the gsmSRF before the inter digit timer expires.
Error Treatment	O	O	O	This IE indicates what specific action shall be taken by the gsmSRF in the event of error conditions occurring.
Interruptable Ann Ind	O	O	O	If this IE is set to TRUE (default value) the announcement is interrupted after the first valid or invalid digit received by the gsmSRF. If this IE is present and explicitly set to FALSE, the announcement will not be interrupted after the first digit is received by the gsmSRF
Voice Information	O	O	O	This IE is optional, where the default value is specified being FALSE. If the VoiceInformation IE is set to FALSE, all valid or invalid digits are entered by DTMF If this IE is present and explicitly set to TRUE, calling user is required to provide all valid or invalid information by speech
Voice Back	O	O	O	This IE is optional, where the default value is specified being FALSE. If the VoiceBack IE is set to FALSE, no voice back information is given by the gsmSRF If this IE is present and explicitly set to TRUE, the valid input digits received by the gsmSRF will be announced back to the calling user immediately after the end of input is received

O Optional (Service logic dependent)

InformationToSend is defined in subclause 9.3.3.

9.3.4 Activity Test

9.3.4.1 Description

This IF is used to check for the continued existence of a relationship between the gsmSCF and gsmSRF. If the relationship is still in existence, then the gsmSRF will respond. If no reply is received, then the gsmSCF will assume that the gsmSRF has failed in some way and will take the appropriate action.

9.3.4.2 Information Elements

This IF contains no information elements.

9.4 gsmSRF to gsmSCF information flows

9.4.1 Assist Request Instructions

9.4.1.1 Description

This IF is sent to the gsmSCF by a gsmSSF which is acting as the assisting gsmSSF or by a gsmSRF

9.4.1.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
CorrelationID	M	M	M	This IE is used to associate the AssistRequestInstructions IF from an assisting gsmSSF or by a gsmSRF with the InitialDP from the initiating gsmSSF.
IP SSP Capabilities	M	M	M	This IE indicates which SRF resources are attached, available and supported within the MSC where the gsmSSF resides or the IP in which the gsmSRF resides.

M Mandatory (The IE shall always be sent)

9.4.2 Prompt And Collect User Information ack (received information)

9.4.2.1 Description

This IF is used by the gsmSRF to indicate the result a Prompt And Collect User Information IF.

9.4.2.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT	Description
Digits Response	C	C	C	This IE indicates the digit sequence received from the end user

C Conditional (The IE shall be sent, if available)

9.4.3 Specialized Resource Report

9.4.3.1 Description

This IF is used to response to a PlayAnnouncement IF when the announcement complete indication is set.

9.4.3.2 Information Elements

This IF contains no information elements.

9.4.4 Activity Test ack

9.4.4.1 Description

This IF is the response to the Activity Test.

9.4.4.2 Information Elements

This IF contains no information elements.

9.5 gsmSCF to Assisting SSF information flows

9.5.1 Cancel

9.5.1.1 Description

This IF is described in section 9.3.

9.5.2 Connect To Resource

9.5.2.1 Description

This IF is described in section 9.2.

9.5.3 Play Announcement

9.5.3.1 Description

This IF is described in section 9.3..

9.5.4 Prompt And Collect User Information

9.5.4.1 Description

This IF is described in section 9.3.

9.5.5 Reset Timer

9.5.5.1 Description

This IF is described in section 9.2.

9.5.6 Activity Test

9.5.6.1 Description

This IF is used to check for the continued existence of a relationship between the gsmSCF and assistSSF. If the relationship is still in existence, then the assistSSF will respond. If no reply is received, then the gsmSCF will assume that the assistSSF has failed in some way and will take the appropriate action.

9.5.6.2 Information Elements

This IF contains no information elements.

9.6 Assisting SSF to gsmSCF information flows

9.6.1 Assist Request Instructions

9.6.1.1 Description

This IF is defined in subclause 9.4.

9.6.2 Prompt And Collect User Information ack (received information)

9.6.2.1 Description

This IF is described in section 9.4.

9.6.3 Specialized Resource Report

9.6.3.1 Description

This IF is described in section 9.4.

9.6.4 Activity Test ack

9.6.4.1 Description

This IF is the response to the Activity Test.

9.6.4.2 Information Elements

This IF contains no information elements.

9.7 gsmSCF to HLR information flows

9.7.1 Any Time Interrogation Request

9.7.1.1 Description

This IF is used to request information (subscriber state and location) from the HLR at any time.

9.7.1.2 Information Elements

The following information elements are required:

Information element name	Required	Description
gsmSCF Address	M	This IE indicates the address of the interrogating gsmSCF.
Requested Info	M	This IE indicates the type of subscriber information being requested: - subscriber location - subscriber state
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity can be one of: - IMSI - MSISDN

M Mandatory (The IE shall always be sent)

9.7.2 Unstructured SS Request

9.7.2.1 Description

This interface is used for the gsmSCF to request data from the MS via the HLR.

9.7.2.2 Information Elements

The following information elements are required:

Information element name	Required	Description
USSD String	M	This IE contains the string that will be sent to the MS.
Data Coding Scheme	M	This IE indicates the characteristics of the USSD string
IMSI	C	This IE identifies the subscriber for which the information is requested
Alerting Pattern	O	This IE indicates an alerting pattern to be sent to the MS.

M Mandatory (The IE shall always be sent)

C Conditional (This IE shall be sent if this IF is the first IF in a USSD dialogue)

O Optional (Service Logic dependent)

9.7.3 Unstructured SS Notify

9.7.3.1 Description

This interface is used for the gsmSCF to send data to the MS via the HLR.

9.7.3.2 Information Elements

The following information elements are required:

Information element name	Required	Description
USSD String	M	This IE contains the string that will be sent to the MS.
Data Coding Scheme	M	This IE indicates the characteristics of the USSD string
IMSI	C	This IE identifies the subscriber for which the information is requested.
Alerting Pattern	O	This IE indicates an alerting pattern to be sent to the MS.

M Mandatory (The IE shall always be sent)

C Conditional (This IE shall be sent if this IF is the first IF in a USSD dialogue)

O Optional (Service Logic dependent)

9.7.4 Process Unstructured SS Data ack

9.7.4.1 Description

This interface is used for the gsmSCF to send the response to the MS via the HLR for the MS initiated operation.

9.7.4.2 Information Elements

The following information element is required:

Information element name	Required	Description
SS User Data	C	This IE contains the string that will be sent to the MS.

C Conditional (The IE shall be sent, if requested and available)

9.7.5 Process Unstructured SS Request ack

9.7.5.1 Description

This interface is used for the gsmSCF to send the response to the MS via the HLR for the MS initiated operation.

9.7.5.2 Information Elements

The following information elements are required:

Information element name	Required	Description
USSD String	C	This IE contains the string that will be sent to the MS.
Data Coding Scheme	C	This IE indicates the characteristics of the USSD string

C Conditional (the presence of the IE depends on the application. Both IEs shall be sent.)

9.8 HLR to gsmSCF information flows

9.8.1 Any Time Interrogation ack

9.8.1.1 Description

This IF is used by the HLR to provide the requested information to the gsmSCF.

9.8.1.2 Information Elements

The following information elements are required:

Information element name	Required	Description
Location Information	C	This IE indicates the location of the served subscriber.
Subscriber State	C	This IE indicates the status of the MS. The possible values of the IE are: - CAMELBusy: The VLR has indicated that the MS is engaged on a transaction for a mobile originating or terminated circuit-switched call. - NetworkDeterminedNotReachable: The VLR has indicated that the network can determine from its internal data that the MS is not reachable. - AssumedIdle: The VLR has indicated that the state of the MS is neither "CAMELBusy" nor "NetworkDeterminedNotReachable". - NotProvidedFromVLR: The VLR did not provide any information on subscriber state even though it was requested.

C Conditional (The IE shall be sent, if requested and available)

Location Information contains the following information:

Information element name	Required	Description
Location Number	C	See 3GPP TS 03.18 [3].
CellIdOrLAI	C	See 3GPP TS 03.18 [3].
Geographical Information	C	See 3GPP TS 03.18 [3].
Age Of Location Information	C	See 3GPP TS 03.18 [3].
VLR number	C	See 3GPP TS 03.18 [3].

C Conditional (The IE shall be sent, if available)

9.8.2 Unstructured SS Request ack

9.8.2.1 Description

This interface is used for the MS to via the HLR send the response to the gsmSCF for the gsmSCF initiated operation.

9.8.2.2 Information Elements

The following information elements are required:

Information element name	Required	Description
USSD String	C	This IE contains the string that will be sent to the gsmSCF.
Data Coding Scheme	C	This IE indicates the characteristics of the USSD string

C Conditional (The presence of the IE depends on the application. Both IEs shall be sent.)

9.8.3 Unstructured SS Notify ack

This IE contains no information element.

9.8.3.1 Description

This interface is used for the MS to via the HLR acknowledge to the gsmSCF that the notification was received.

9.8.4 Process Unstructured SS Data

9.8.4.1 Description

This interface is used for the gsmSCF to request data from the MS via the HLR.

9.8.4.2 Information Elements

The following information elements are required:

Information element name	Required	Description
SS User Data	M	This IE contains the string that will be sent to the MS.

M Mandatory (The IE shall always be sent)

9.8.5 Process Unstructured SS Request

9.8.5.1 Description

This interface is used for the MS to request data from the gsmSCF via the HLR.

9.8.5.2 Information Elements

The following information elements are required:

Information element name	Required	Description
USSD String	M	This IE contains the string that will be sent to the gsmSCF, including the Service Code.
Data Coding Scheme	M	This IE indicates the characteristics of the USSD string
IMSI	M	This IE identifies the subscriber.
MSISDN	O	This IE contains the basic MSISDN of the subscriber who has requested the USSD operation. This IE is used as an operator option.
Originating Entity Number	M	This IE identifies the functional entity initiating the information flow. In this case, this shall be the address of the HLR.

M Mandatory (The IE shall always be sent)

O Optional (Operator option)

9.8.6 Begin Subscriber Activity

9.8.6.1 Description

This Information Flow is used by the HLR to start subscriber activity towards the gsmSCF for USSD purposes.

9.8.6.2 Information Elements

The following information elements are required:

Information element name	Required	Description
IMSI	M	This IE identifies the subscriber.
Originating Entity Number	M	This IE identifies the functional entity initiating the subscriber activity. In this case, this shall be the address of the HLR.

M Mandatory (The IE shall always be sent)

9.9 HLR to VLR information flows

9.9.1 Delete Subscriber Data

9.9.1.1 Description

This IF is specified in 3GPP TS 09.02 [4] and is used by the HLR to delete subscriber data in the VLR.

9.9.1.2 Information Elements

The Delete Subscriber Data contains the following CAMEL specific IE:

Information element name	Required	Description
CAMEL Subscription Info Withdraw	C	This IE identifies that all CSIs shall be deleted from the subscriber data in VLR.

C Conditional (The IE shall be sent when deletion is requested)

9.9.2 Insert Subscriber Data

9.9.2.1 Description

This IF is specified in 3GPP TS 09.02 [4] and used by the HLR to insert subscriber data in the VLR.

9.9.2.2 Information Elements

Insert Subscriber Data contains the following CAMEL specific IE:

Information element name	Required	Description
O-CSI	C	This IE identifies the subscriber as having originating CAMEL services.
SS-CSI	C	This IE identifies the subscriber as having supplementary service invocation notification services. It contains the Notification Criteria and gsmSCFAddress.

C Conditional (The IE shall be sent, if required)

O-CSI contains the following information:

Information element name	Required	Description
gsmSCF Address	M	This IE is described in section 6.1
Service Key	M	This IE is described in section 6.1.
Default Call Handling	M	This IE is described in section 6.1.
TDP List	M	This IE is described in section 6.1.
DP Criteria	O	This IE is described in section 6.1.
CAMEL Capability Handling	C	This IE is described in section 6.1. If this IE is absent, this indicates that CAMEL phase 1 is asked.

M Mandatory

C Conditional

O Optional (service logic dependant)

9.9.3 Provide Subscriber Info

9.9.3.1 Description

This IF is used by the HLR to request information (subscriber state and location) from the VLR at any time.

9.9.3.2 Information Elements

Provide Subscriber Info contains the following CAMEL specific IE:

Information element name	Required	Description
Requested Info	M	This IE indicates the type of subscriber information to the gsmSCF. - subscriber location - subscriber state
Subscriber Identity	M	This IE identifies the subscriber for which the information is requested. The identity can be: - IMSI: The IMSI shall be accompanied by a LMSI if one was provided by the VLR.

M Mandatory (The IE shall always be sent)

9.9.4 Provide Roaming Number

9.9.4.1 Description

This IF is specified in 3GPP TS 03.18 [3] and used by the HLR to request a roaming number from the VLR.

9.9.4.2 Information Elements

Provide Roaming Number contains the following CAMEL specific IE:

Information element name	Required	Description
Suppression Of Announcements	C	This IE indicates that announcements or tones generated as a result of unsuccessful call setup shall be suppressed.
Call Reference Number	M	This IE carries the Call Reference Number provided by the GMSC in the Send Routeing Info IF.
GMSC Address	M	This IE is the E.164 address of the GMSC
Alerting Pattern	C	This IE indicates the kind of Alerting Pattern to be applied.
GMSC CAMEL Phases	C	This IE indicates the CAMEL Phases supported in the GMSC.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent, if received from the GMSC in the Send Routeing Info)

9.10 VLR to HLR information flows

9.10.1 Insert Subscriber Data ack

9.10.1.1 Description

This IF is specified in 3GPP TS 09.02 [4] and used by the VLR to indicate to the HLR the result of the Insert Subscriber Data IF.

9.10.1.2 Information Elements

Insert Subscriber Data ack contains the following CAMEL specific IE:

Information element name	Required	Description
Supported CAMEL Phases	C	This IE identifies which CAMEL phases are supported by the MSC/VLR.

C Conditional (The IE shall always be sent when a CSI has been included in the ISD)

9.10.2 Provide Subscriber Info ack

9.10.2.1 Description

This IF is used by the VLR to provide the requested information to the HLR.

9.10.2.2 Information Elements

Provide Subscriber Info ack contains the following CAMEL specific IE:

Information element name	Required	Description
Location Information	C	This IE indicates the location of the served subscriber. The elements contained in this IE are specified in 3GPP TS 03.18 ([3]).
Subscriber State	C	This IE indicates the status of the MS. The states are: - CAMELBusy: The MS is engaged on a transaction for a mobile originating or terminated circuit-switched call. - NetworkDeterminedNotReachable: The network can determine from its internal data that the MS is not reachable. - AssumedIdle: The state of the MS is neither "CAMELBusy" nor "NetworkDeterminedNotReachable".

C Conditional (The IE shall be sent, if requested and available)

9.10.3 Update Location

9.10.3.1 Description

This IF is used by the VLR to provide the information about supported CAMEL phases to the HLR.

9.10.3.2 Information Elements

Update Location contains the following CAMEL specific IE:

Information element name	Required	Description
Supported CAMEL phases	C	This IE indicates which phases of CAMEL are supported. It shall be present if a CAMEL phase different from phase 1 is supported. Otherwise may be absent.

9.10.4 Restore Data

9.10.4.1 Description

This IF is used by the VLR to provide the information about supported CAMEL phases to the HLR.

9.10.4.2 Information Elements

Restore Data contains the following CAMEL specific IE:

Information element name	Required	Description
Supported CAMEL phases	C	This IE indicates which phases of CAMEL are supported. It shall be present if a CAMEL phase different from phase 1 is supported. Otherwise may be absent.

9.11 HLR to GMSC information flows

9.11.1 Send Routeing Info ack

9.11.1.1 Description

This IF is specified in 3GPP TS 03.18 [3] and is used by the HLR to transfer the requested routeing information to the GMSC.

9.11.1.2 Information Elements

Send Routeing Info ack contains the following CAMEL specific IE:

Information element name	Required	Description
Location Information	C	This IE indicates the location of the served subscriber.
O-CSI	C	This IE identifies the subscriber as having originating CAMEL services. Shall be sent if O-CSI is active, and CFU or CFNRc has been invoked, or if both O-CSI and T-CSI are active.
Subscriber State	C	This IE indicates the status of the MS. The possible values of the IE are: - CAMELBusy: The VLR has indicated that the MS is engaged on a transaction for a mobile originating or terminated circuit-switched call. - NetworkDeterminedNotReachable: The VLR has indicated that the network can determine from its internal data that the MS is not reachable. - AssumedIdle: The VLR has indicated that the state of the MS is neither "CAMELBusy" nor "NetworkDeterminedNotReachable". - NotProvidedFromVLR: The VLR did not provide any information on subscriber state even though it was requested.
T-CSI	C	This IE identifies the subscriber as having terminating CAMEL services. Shall be sent if T-CSI is active and no Suppress T-CSI indicator is present in the SRI.
Basic Service Code	C	This IE indicates the type of basic service i.e., teleservice or bearer service.
CUG Subscription Flag	C	This IE indicates if the called party has a CUG subscription. It shall only be sent if the T-CSI is active and included in the Send Routing Information ack.

C Conditional (The IE shall be sent, if available)

C' Conditional (The IE shall be sent, if available and indicated by Subscriber Information in Send Routeing Information ack indicator.)

Location Information contains the following information:

Information element name	Required	Description
Location Number	C'	See 3GPP TS 03.18 [3].
CellIdOrLAI	C'	See 3GPP TS 03.18 [3].
Geographical Information	C'	See 3GPP TS 03.18 [3].
Age Of Location Information	C'	See 3GPP TS 03.18 [3].
VLR number	C	See 3GPP TS 03.18 [3].

C Conditional (The IE shall be sent, if available)

C' Conditional (The IE shall be sent, if available and indicated by Subscriber Information in Send Routeing Information ack indicator.)

O-CSI is defined in section 0.

T-CSI contains the following information:

Information element name	Required	Description
gsmSCF Address	M	This IE is described in section 6.1.
Service Key	M	This IE is described in section 6.1.
Default Call Handling	M	This IE is described in section 6.1.
TDP List	M	This IE is described in section 6.1.
CAMEL Capability Handling	C	This IE is described in section 6.1. If this IE is absent, this indicates that CAMEL phase 1 is asked.

M Mandatory

C Conditional

9.12 GMSC to HLR information flows

9.12.1 Send Routeing Info

9.12.1.1 Description

This IF is described in 3GPP TS 03.18 [3] and is used to request information from the HLR to route an MT call.

9.12.1.2 Information Elements

Send Routeing Info contains the following CAMEL specific IE:

Information element name	Required	Description
Alerting Pattern	C	This IE indicates the kind of Alerting Pattern to be applied.
Suppression Of Announcement	C	This IE indicates that announcements or tones generated as a result of unsuccessful call setup shall be suppressed. Shall be sent in the interrogation if available, i.e., when it has been received from the gsmSCF.
Suppress T-CSI	C	This IE indicates that T-CSI shall be suppressed. Shall always be sent in the second interrogation
Supported CAMEL Phases	M	This IE lists the supported CAMEL phases.
Call Reference Number	M	This IE carries the Call Reference Number allocated for the call by the GMSC. Shall be allocated once per call and sent in both first and second interrogations.
GMSC Address	M	This IE is the E.164 address of the GMSC

C Conditional (The IE shall be sent, if received from the gsmSCF or set by the gsmSSF)

M Mandatory (The IE shall always be sent when the GMSC supports CAMEL)

9.13 MSC to gsmSCF information flows

9.13.1 SS Invocation Notification

9.13.1.1 Description

This IF is generated by the MSC when it shall notify the gsmSCF of a supplementary service invocation.

9.13.1.2 Information Elements

The following information elements are required:

Information element name	Required	Description
Notification Event	M	This IE indicates the supplementary service invocation, resulting in the SS Invocation Notification IF. Only the following Supplementary Services are allowed : Explicit Call Transfer, Call Deflection, Multi Party.
Notification Event Specific Information	C	In the case of ECT, the sending entity shall include the called party for each call originated by the subscriber and relevant to the ECT invocation. Note : the subscriber may have originated zero, one or two calls relevant to the ECT service. In the case of CD, the deflected to number shall be included in this information element. In the case of MPTY, this IE shall be omitted.
IMSI	M	This IE identifies the mobile subscriber who has invoked the supplementary service to be notified.
MSISDN	M	This IE identifies the mobile subscriber who has invoked the supplementary service to be notified.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent if applicable)

9.14 VMSC to GMSC information flows

9.14.1 Resume Call Handling

9.14.1.1 Description

This IF is described in 3GPP TS 03.79 [15] and is used to request the GMSC to take over handling the call so that it can be forwarded from the GMSC.

9.14.1.2 Information Elements

Resume Call Handling contains the following CAMEL specific IE:

Information element name	Required	Description
O-CSI	C	This IE contains O-CSI without triggering criteria. It indicates that CAMEL handling applies for a forwarded call. Shall be present if CAMEL handling applies; otherwise shall be absent.

C Conditional (The IE shall be sent if applicable)

9.15 MSC to VLR information flows

9.15.1 Send Info For Outgoing Call

9.15.1.1 Description

This IF is described in 3GPP TS 03.18 [3] and is used to request the VLR to provide information to handle an outgoing call.

9.15.1.2 Information Elements

Send Info For Outgoing Call contains the following CAMEL specific IE

Information element name	Required	Description
Suppress O-CSI	C	This IE indicates that O-CSI shall be suppressed. Shall always be sent in the second interrogation.

C Conditional (The IE shall be sent if applicable)

9.15.2 Send Info For Reconnected Call

9.15.2.1 Description

This IF is used to request the VLR to provide information to handle a reconnected call.

9.15.2.2 Information Elements

Send Info For Reconnected Call contains the following IE

Information element name	Required	Description
Called number	M	E.164 number of the call destination.
Bearer service	C	Bearer service required for the MO call, derived from the GSM bearer capability information received in the setup request from the MS. One of bearer service or teleservice shall be present.
Teleservice	C	Teleservice required for the MO call, derived from the GSM bearer capability information received in the setup request from the MS or from the emergency setup request from the MS. One of bearer service or teleservice shall be present.
CUG index	C	For the definition of this IE, see ETS 300 546 [9]. Shall be present if it was received in the setup request from the MS.
Suppress preferential CUG	C	For the definition of this IE, see ETS 300 546 [9]. Shall be present if it was received in the setup request from the MS.
Suppress CUG outgoing access	C	For the definition of this IE, see ETS 300 546 [9]. Shall be present if it was received in the setup request from the MS.
Suppress O-CSI	C	This IE indicates that O-CSI shall be suppressed. Shall always be sent in the second interrogation.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent if applicable)

9.16 VLR to MSC information flows

9.16.1 Complete Call

9.16.1.1 Description

This IF is described in 3GPP TS 03.18 [3] and is used to instruct the MSC to continue the connection of a call.

9.16.1.2 Information Elements

Complete Call contains the following CAMEL specific IE:

Information element name	Required	Description
O-CSI	C	This IE indicates that CAMEL handling applies for an MO call. Shall be present in the response to the first interrogation for an MO call if CAMEL handling applies; otherwise shall be absent. Shall be absent in the response to the second interrogation for an MO call and in the response to the interrogation for an MT call.
Call Reference Number	M	This IE carries the Call Reference Number provided by the HLR in the Provide Roaming Number IF.
GMSC Address	M	This IE is the E.164 address of the GMSC.

M Mandatory (The IE shall always be sent)

C Conditional (The IE shall be sent if applicable)

9.16.2 Process Call Waiting

9.16.2.1 Description

This IF is described in 3GPP TS 03.18 [3] and is used to instruct the MSC to continue the connection of a waiting call.

9.16.2.2 Information Elements

Process Call Waiting contains the following CAMEL specific IE:

Information element name	Required	Description
Call Reference Number	M	This IE carries the Call Reference Number provided by the HLR in the Provide Roaming Number IF.
GMSC Address	M	This IE is the E.164 address of the GMSC.

M Mandatory (The IE shall always be sent)

9.16.3 Send Info For Incoming Call ack

9.16.3.1 Description

This IF is described in 3GPP TS 03.18 [3] and is used to indicate that the incoming call for which the MSC requested subscription information shall be forwarded.

9.16.3.2 Information Elements

Send Info For Incoming Call ack contains the following CAMEL specific IE:

Information element name	Required	Description
O-CSI	C	This IE indicates that CAMEL handling applies for a forwarded call. Shall be present if CAMEL handling applies; otherwise shall be absent.
Suppression Of Announcement	C	This IE indicates that announcements or tones generated when the call is forwarded shall be suppressed. Shall be sent if it was received in the Provide Roaming Number for this call.
Call Reference Number	M	This IE carries the Call Reference Number provided by the HLR in the Provide Roaming Number IF.
GMSC Address	M	This IE is the E.164 address of the GMSC.

C Conditional (The IE shall be sent if applicable)

9.16.4 Send Info For Incoming Call negative response

9.16.4.1 Description

This IF is described in 3GPP TS 03.18 [3] and is used to indicate that the incoming call for which the MSC requested subscription information shall not be connected.

9.16.4.2 Information Elements

Send Info For Incoming Call negative response contains the following CAMEL specific IE which may be attached as a IE to any of the negative response values defined in 3GPP TS 03.18 [3]:

Information element name	Required	Description
Suppression Of Announcement	C	This IE indicates that announcements or tones generated as a result of unsuccessful call setup shall be suppressed. Shall be sent if it was received in the Provide Roaming Number for this call.

C Conditional (The IE shall be sent if applicable)

10 Interaction with supplementary services

10.1 Line identification

For further study.

10.2 Call forwarding services

10.2.1 Registration of Call Forwarding

The functional behaviour for the registration of the Call Forwarding supplementary service is defined in 3GPP TS 03.82 [13]. The procedure specific to CAMEL is defined in this subclause:

- CAMEL_Check_CF_Interaction

10.2.2 Invocation of Call Forwarding

The functional behaviour for the invocation of the Call Forwarding supplementary service is defined in 3GPP TS 03.18 [3].The following additional requirements apply.

When call forwarding is invoked for a CAMEL subscriber with O-CSI, the gsmSSF shall send the FTN to the gsmSCF in the format in which it was received from the HLR.

An HLR shall not send an FTN which is not in international E.164 format to a VLR or GMSC which does not support CAMEL phase 2, i.e.:if the HLR is handling a request from a GMSC for routeing information and the forwarded-to number is registered a format other than international E.164, the service logic in the HLR shall behave as if the call forwarding is provisioned but not registered.

10.3 Call Barring services

When a CAMEL subscriber with O-CSI and TIF-CSI attempts to activate a conditional call barring service (BOIC,BOIC-exHC), the HLR shall not check the interactions with call forwarding.

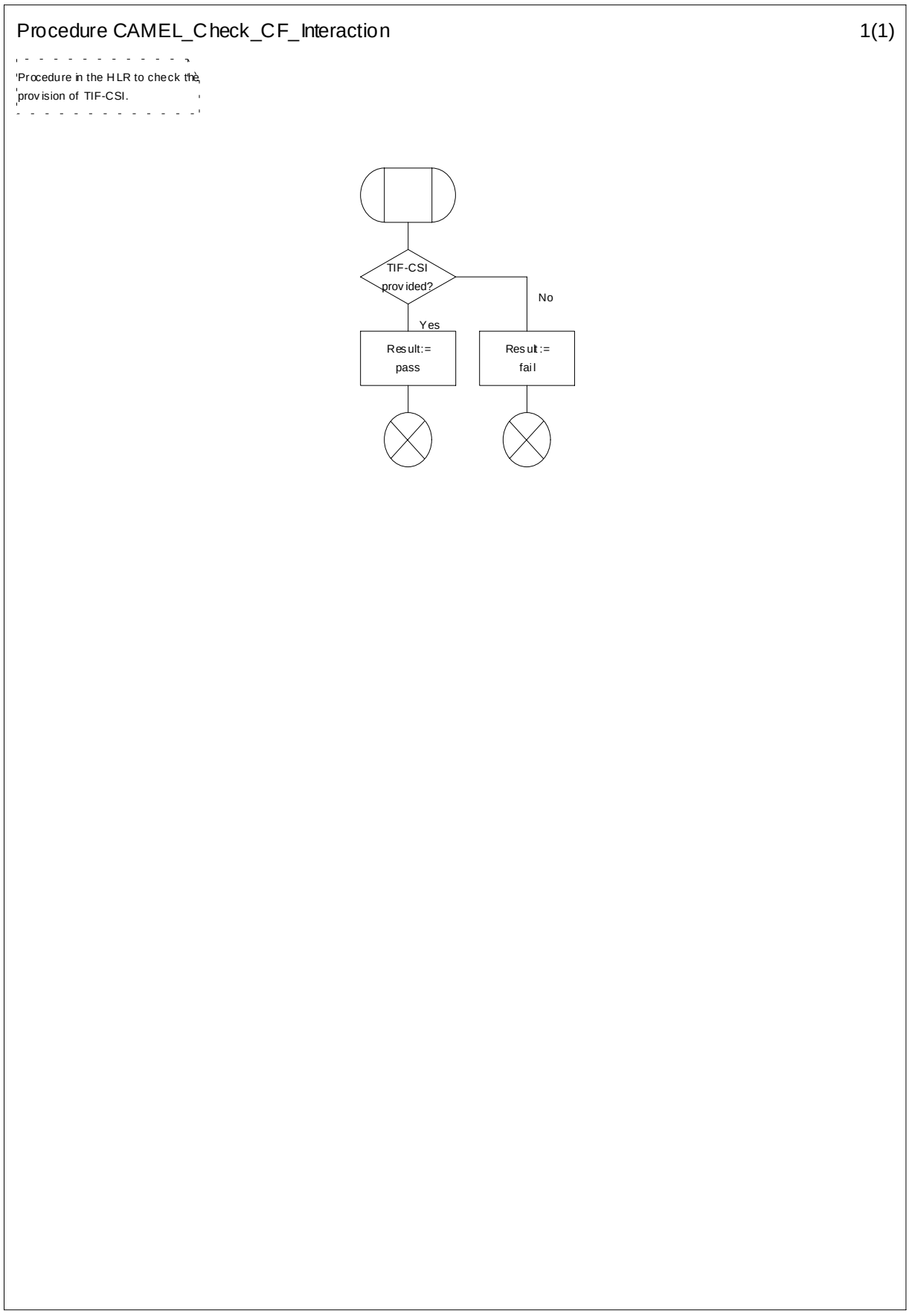

Figure 58a: Procedure CAMEL_Check_CF_Interaction (sheet 1)

Annex A (informative): Change history

TSG#	TDoc	CR	Rev	Phs	VERS	NEW_VERS	SUBJECT
s26	98-0411	A028		R97	6.0.0	6.1.0	GSM Forwarding Pending Indication in IDP Operation
s26	98-0410	A019	2	R97	6.0.0	6.1.0	Combination clean up CR on CAMEL Phase 2
s26	98-0404	A021	1	R97	6.0.0	6.1.0	Error handling in 3GPP TS 03.78 paragraph 8.5
s26	98-0404	A024	1	R97	6.0.0	6.1.0	Progress is to be sent on CONNECT reception
s26	98-0404	A027		R97	6.0.0	6.1.0	Release by A party for forwarded calls and CAMEL
s26	98-0411	A026	1	R97	6.0.0	6.1.0	Supported CAMEL Phase indication
					6.1.0	6.1.1	Version update for publication
s27		A029	1	R97	6.1.1	6.2.0	Corrections on 3GPP TS 03.78
s27		A034	2	R97	6.1.1	6.2.0	Interworking CAMEL with the General Bearer Service
s27		A025	2	R97	6.1.1	6.2.0	CAMEL Phase 2 Stage 2
s27 mail		A037	1	R97	6.1.1	6.3.0	Suppression of Not_Reachable DPs
s28		A032	6	R97	6.2.0	"	Correction to handling of Call Information Report
s28		A039	1	R97	6.1.1	"	Progress Indicator
s28		A040	1	R97	6.1.1	"	SCI handling in 03.78
s28		A041	3	R97	6.2.0	"	Implicit Disarming of Detection Points.
s28		A042		R97	6.1.0	"	Tariff Switch Handling Correction
s28		A046	1	R97	6.2.0	"	Correction of 03.78 SDLs
s28		A048	2	R97	6.2.0	"	Clarification of handling of call forwarding
s28		A049		R97	6.2.0	"	Correction of the 03.78 SDLs for Reconnect in case for MTC
s28		A050	2	R97	6.2.0	"	Corrections on CAMEL phase 2 stage 2
s28		A052		R97	6.2.0	"	USSD
s28		A055		R97	6.2.0	"	P&C (Prompt & Collect) correction
s28		A056		R97	6.2.0	"	Use of Facility message to transport the E parameters
s28		A057		R97	6.2.0	"	Criteria for inhibiting triggering
s28		A058		R97	6.2.0	"	Clarifying description of Implicit Disarming rules
s28		A059		R97	6.2.0	"	Removal of 'Send Calculation To SCP Indication' Information Element.
s28		A060	1	R97	6.2.0	"	Insertion of the handling of the call duration and of E parameters at the
s28		A061	3	R97	6.2.0	"	Timer TNRy
s28		A063	1	R97	6.2.0	"	Addition of North American Carrier related Information CAMEL Phase 2
s28		A067	1	R97	6.2.0	"	CAMEL 2 clarifications to charging issues
s28		A069		R97	6.2.0	"	Interactions of CAMEL with call forwarding & call barring
s29	N2-99217	A070	1	R97	6.3.0	6.4.0	Inclusion of Subscriber Activity Information Flow
s29	3C99-275	A074		R97	6.3.0	"	Inclusion of Alerting Pattern in Provide Roaming Number (PRN)
s29	N2-99225	A075	1	R97	6.3.0	"	Dialled Number String Format
s29	N2-99244	A076	2	R97	6.3.0	"	Handling of AC/ACR in DP Busy, DP No Answer and DP Route Select
s29	3C99-480	A083		R97	6.3.0	"	Inclusion of Activity Test IF between gsmSCF & gsmSRF and gsmSCF
s29	N2-99238	A084	1	R97	6.3.0	"	Correction of USSD Information flows
s29	N2-99343	A085	2	R97	6.3.0	"	Various corrections
s29	N2-99223	A092		R97	6.3.0	"	Correction of CAMEL Phase interworking with Call Forwarding
s29	N2-99255	A093		R97	6.3.0	"	Renaming of Call Active Variable
s29	N2-99310	A099		R97	6.3.0	"	Reporting of O/T_Abandon DP when caller clears during O/T_Busy,
s29	N2-99338	A100	1	R97	6.3.0	"	Clarification on the scope of CAMEL Capability Handling parameter
s29	N2-99458	A102		R97	6.3.0	"	Refining trigger criteria at DP2, due to the introduction of North
S29	N2-99576	A103		R97	6.3.0	"	Introduction of MSISDN Parameters in Process Unstructured
s29	N2-99646	A104	3	R97	6.3.0	"	MSC address in Initial DP
s29	N2-99630	A105		R97	6.3.0	"	Correction of gsmSDL; return to idle after ACR
s29	N2-99638	A106	2	R97	6.3.0	"	Notification of call forwarding to the gsmSCF
s29	N2-99590	A011	1	R97	6.0.0	"	Notification of call forwarding to the gsmSCF
s29	N2-99591	A012		R98	7.0.0	"	Notification of call forwarding to the gsmSCF
s29	N2-99569	A004	2	R97	6.0.0	"	Modifications to call forwarding due to CAMEL Phase 2
s29	3C99-479	A207		R97	6.3.0	"	Clarification in ASN.1 encoding of O-CSI and T-CSI.
s29	N2-99233	A211		R98	7.0.0	"	Clarification in ASN.1 encoding of O-CSI and T-CSI
s29	N2-99270	A213	1	R97	6.3.0	"	Introduction of MSISDN in USSD operation
s29	N2-99269	A215		R98	7.0.0	"	Introduction of MSISDN in USSD operation
s29	N2-99643	A235	1	R97	6.3.0	"	Modification of the O-CSI ASN1 structure
S29	N2-99650	A237	1	R98	7.0.0	"	Modification of the O-CSI ASN.1 structure
s29	N2-99239	A042	3	R97	6.3.0	"	SCCP
s29	3C99-407	A055		R97	6.3.0	"	Corrections

TSG#	TDoc	CR	Rev	Phs	VERS	NEW_VERS	SUBJECT
s29	3C99-481	A057		R97	6.3.0	"	Inclusion of Activity Test IF between gsmSCF & gsmSRF and gsmSCF
s29	N2-99344	A058	3	R97	6.3.0	"	Various corrections
s29	N2-99334	A065		R97	6.3.0	"	Removal of redundant reference
s29	N2-99593	A068	1	R97	6.3.0	"	Notification of call forwarding to the gsmSCF
s29	N2-99647	A070	1	R97	6.3.0	"	MSC address in the InitialDP operation
s29	N2-99639	A072	1	R97	6.3.0	"	Interworking with Q.1218 and ETSI Core INAP
s29	N2-99630	A105		R97	6.3.0	"	Correction of gsmSDL; return to idle after ACR
							v6.4.1 created as CR omitted from v6.4.0
s30	N2-C85	A130	2	R97	6.4.0	6.5.0	Alignment of CAMEL2 FCI & handling of CIR
s30	N2-925	A127	1	"	"	"	Clarification on Call Reference Number and GMSC address
s30	N2-939	A108	2	"	"	"	Inclusion of the SS invocation notification procedure
s30	N2-B25	A134		"	"	"	Removal of TDP criteria from resume call handling
s30	N2-C45	A132	2	"	"	"	Call Reference Number
s30	N2-C53	A136	1	"	"	"	GMSC CAMEL phases in Provide Roaming Number
s30	N2-C59	A141	1	"	"	"	Correction of process gsmSSF SDL
s30	N2-C55	A138	1	"	"	"	Value of the Active Call parameter in ACR operation
s30	NP-99332	A146		"	"	"	Correction of Inhibiting Triggering Criteria
CN#07	NP-000033	A151	1	R97	6.5.0	6.6.0	Correction of CF notification
CN#07	NP-000033	A153	1	R97	6.5.0	6.6.0	Correction on gsmSSF SDL; return to idle after ACR
CN#08	NP-000241	A155	2	R97	6.6.0	6.7.0	gsmSSF DP handling in CF
CN#08	NP-000240	A157	2	R97	6.6.0	6.7.0	Usage of Announcement Suppression Indicator
					6.7.0	6.8.0	Conversion to 3GPP layout and number, December 2000
CN#10	NP-000614	A159	5	R97	6.7.0	6.8.0	Correction on CF notification

History

Document history		
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