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Foreword

This Technical Specification (TS) has been produced by the Special Mobile Group (SMG).

The present document defines the stage 2 description of Customized Applications for Mobile network Enhanced Logic (CAMEL) within the digital cellular telecommunications system.

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

Version 5.x.y

where:

5 indicates GSM Phase 2+ Release 1996

x the second digit is incremented for changes of substance, i.e. technical enhancements, corrections, updates, etc.

y the third digit is incremented when editorial only changes have been incorporated in the specification.

1 Scope

The present document specifies the stage 2 description for the first phase (see GSM 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 the present document, 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 first phase the CAMEL feature supports:

- mobile originated and forwarded calls;
- mobile terminating calls;
- any time interrogation;
- suppression of announcements;

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 to 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 in HPLMN 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1996 document, references to GSM documents are for Release 1996 versions (version 5.x.y).

[1] GSM 01.04 (ETR 350): "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.78: "Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL) - stage 1

[3] GSM 03.18 (TS 101 043): "Digital cellular telecommunications system (Phase 2+); Basic call handling; Technical realisation ".

[4] GSM 03.79 (TS 101 045): "Digital cellular telecommunications system (Phase 2+); Support of Optimal Routeing (SOR); Technical realisation"

[5] GSM 09.02 (ETS 300 974): "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[6] GSM 09.78 (TS 101 046): "Digital cellular telecommunications system (Phase 2+); Customized Applications for Mobile network Enhanced Logic (CAMEL): CAMEL Application Part (CAP) specification".

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

3 Definitions 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 to 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.

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 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.

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.

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 shall be delivered.

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 part of the T/O-CSI.

Subscriber State: See GSM 02.78 [2].

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.

3.2 Abbreviations

Abbreviations used in the present document are listed in GSM 01.04.

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
gsmSSF	GSM Service Switching Function
HLR	Home Location Register
HPLMN	Home PLMN
IE	Information Element
IF	Information Flow
IPLMN	Interrogating PLMN
MSC	Mobile service Switching Centre
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
T-BCSM	Terminating Basic Call State Model
T-CSI	Terminating CAMEL Subscription Information
TDP	Trigger Detection Point
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 4/1 shows the functional entities involved in calls requiring CAMEL support. The architecture is applicable to the first phase of CAMEL.

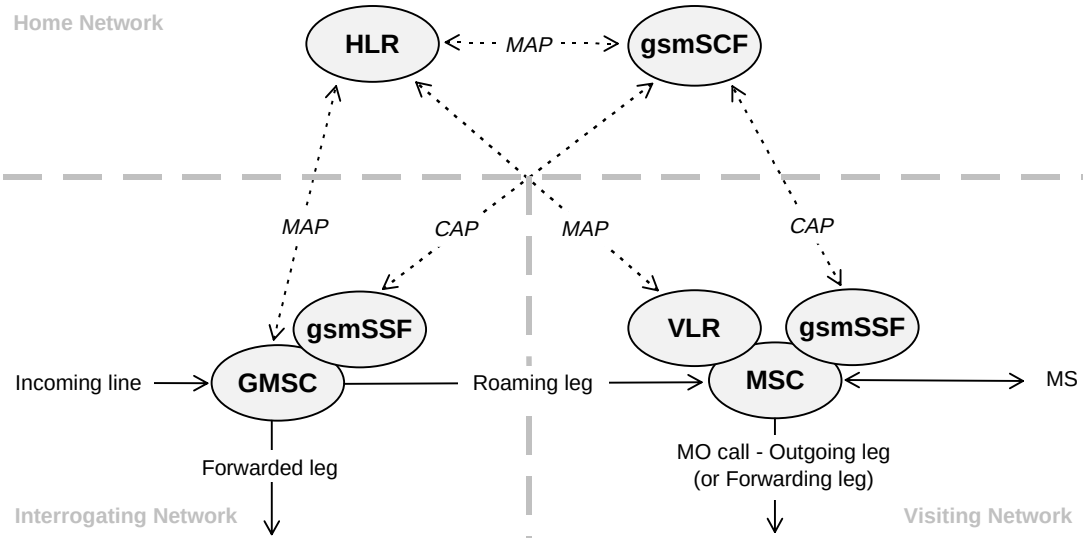

Figure 4/1: Functional architecture for support of CAMEL

HLR: The HLR stores the O/T-CSI for subscribers requiring CAMEL support. The O-CSI is sent to the VLR in case of Location Update or if the O-CSI is updated. The O/T-CSI is sent to the GMSC when the HLR responds to a request for routing information. 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 instruction 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 instruction 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.

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

gsmSSF: see subclause 3.1.

gsmSCF: 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 routing 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. 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 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. Support of the gsmSCF - HLR interface is a network operator option. As a network operator option the HLR may refuse to provide the information requested by 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 awaiting instructions from the gsmSCF when encountering the DP.

- 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 characterised by the following attributes:

a) 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:

   - A DP is statically armed by provisioning the O/T-CSI in the HLR. A statically armed DP remains armed until the O/T-CSI is withdrawn.

   - 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.

b) 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

Since a DP may be armed as an EDP-N or an EDP-R for the same call, the gsmSSF should apply the following set of rules during DP processing to ensure single point of control:

- A control relationship persists as long as there is ≥ 1 EDP-R armed for this portion of the call. A control relationship terminates if there are no more EDP-Rs armed or the call clears. During a control relationship, EDPs are disarmed by the gsmSSF as they are encountered and reported to the SCF, or when the call clears.

- A control relationship changes to a monitor relationship if there are no more EDP-Rs armed and ≥ 1 EDP-N armed. A monitor relationship terminates if there are no more EDP-Ns armed or the call clears. During a monitor relationship, EDP-Ns are disarmed by the gsmSSF as they are encountered and reported to the SCF, or when the call clears.

When the armed TDP-R is encountered triggering is unconditional.

6 Description of CAMEL Subscriber Data

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

6.1.1 Content of the O/T-CSI

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

6.1.1.1 gsmSCF address

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

6.1.1.2 Service Key

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

6.1.1.3 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.

6.1.1.4 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.

6.2 Description of Subscriber Information in S R I Ack indicator

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.

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 7.1/1 shows the components that have been identified to describe a BCSM.

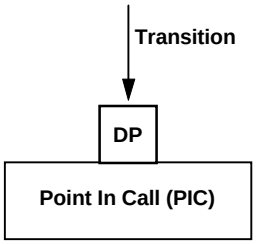

Figure 7.1/1: BCSM Components

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 should be taken in case of the DP is armed.

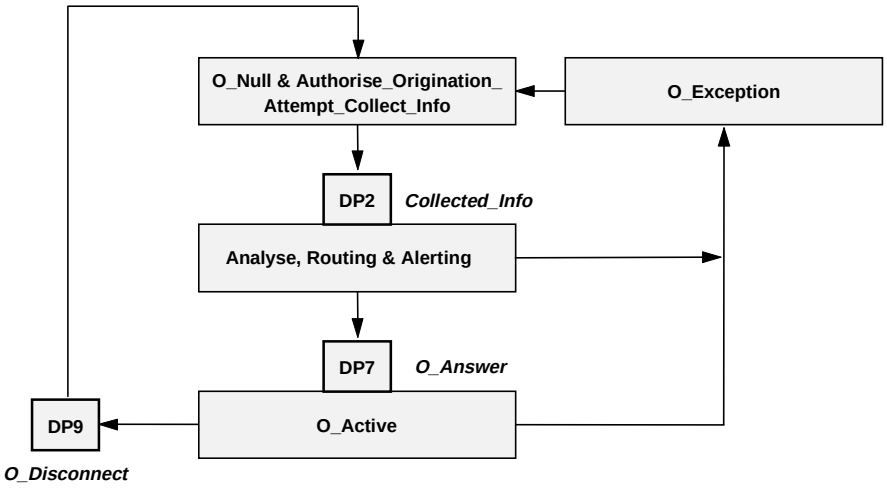

Figure 7.2/1: Originating BCSM for CAMEL

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

Table 1: Definition of CAMEL Detection Points

CAMEL Detection Point:	[7]:	DP Type	Description:
DP2 Collected_Info	DP2	TDP-R	Indication that the O-CSI is analysed.
DP7 O_Answer	DP7	EDP-N	Indication that the call is accepted and answered by the terminating party.
DP9 O_Disconnect	DP9	EDP-N, EDP-R	A disconnect indication is received from the originating party or from the terminating party.

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 [7] the specific descriptions differ.

7.2.1.1.1 O_Null & Authorise_Origination_Attempt_Collect_Info

Entry events:
- Disconnect and clearing of a previous call (DP9 - O_Disconnect) or default handling of exceptions by gsmSSF/(G)MSC completed.

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

NOTE: The ODB category «Barring of outgoing calls when roaming» causes the HLR to send the category «BAOC» 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 conditions are:
  - Calling party abandons call.

7.2.1.1.2 Analyse, Routing & Alerting

Entry events:
- Originating CSI is analysed. (DP2 - Collected Info)

Functions:
- Information being analysed and/or translated according to dialling plan to determine routing address.
- Routing 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. Example exception conditions are:
  - Calling party abandons call.
  - The called party is busy.
  - The called party does not answer the call.
  - Attempt to select the route for the call fails.

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 and terminating party. Call release is awaited.

Exit events:
- A disconnection indication is received from the originating party, or received from the terminating party via the terminating half BCSM. (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 that 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 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 should be taken in case of the DP is armed.

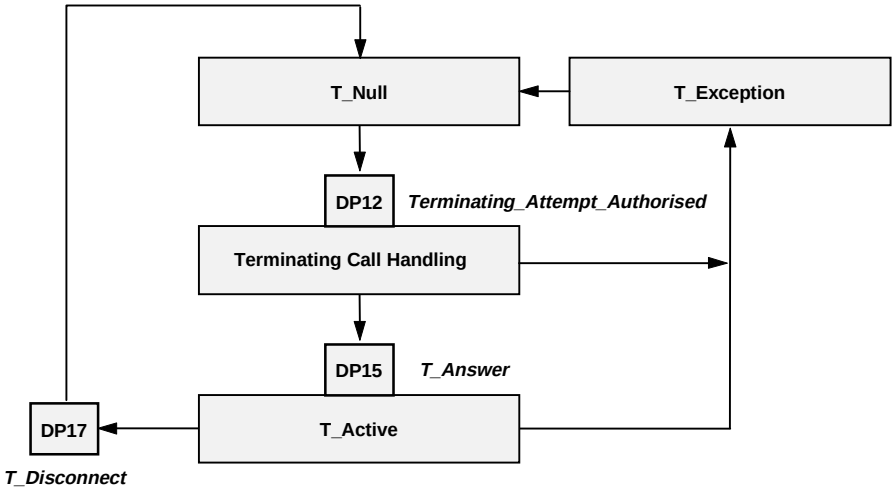

Figure 7.3/1: T-BCSM in the GMSC

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:	[7]:	DP Type	Description:
DP12 Terminating_Attempt_Authorised	DP12	TDP-R	Indication that the T-CSI is analysed.
DP15 T_Answer	DP15	EDP-N	Call is accepted and answered by terminating party
DP17 T_Disconnect	DP17	EDP-N, EDP-R	A disconnect indication is received from the terminating party or from the originating party.

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 [7] the specific descriptions differ.

7.3.1.1.1 T_Null

Entry events:

- Disconnect and clearing of a previous call (DP 17) or default handling of exceptions by gsmSSF/GMSC completed.

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)

Functions:
- The response from HLR is analysed.
- Routing 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 lead to the T_Exception PIC. Example exception conditions are:
  - Calling party abandons call.
  - The call setup to the MSC/GMSC was not successful.

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 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 that 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 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 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 routing. If optimal routing 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.

7.4.1 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.

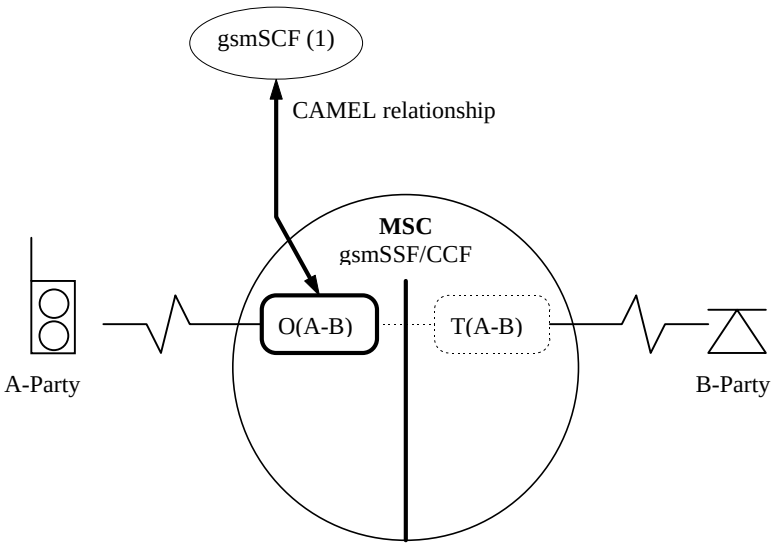

Figure 7.4/1: BCSM Scenario for Mobile Originated Call

7.4.2 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.

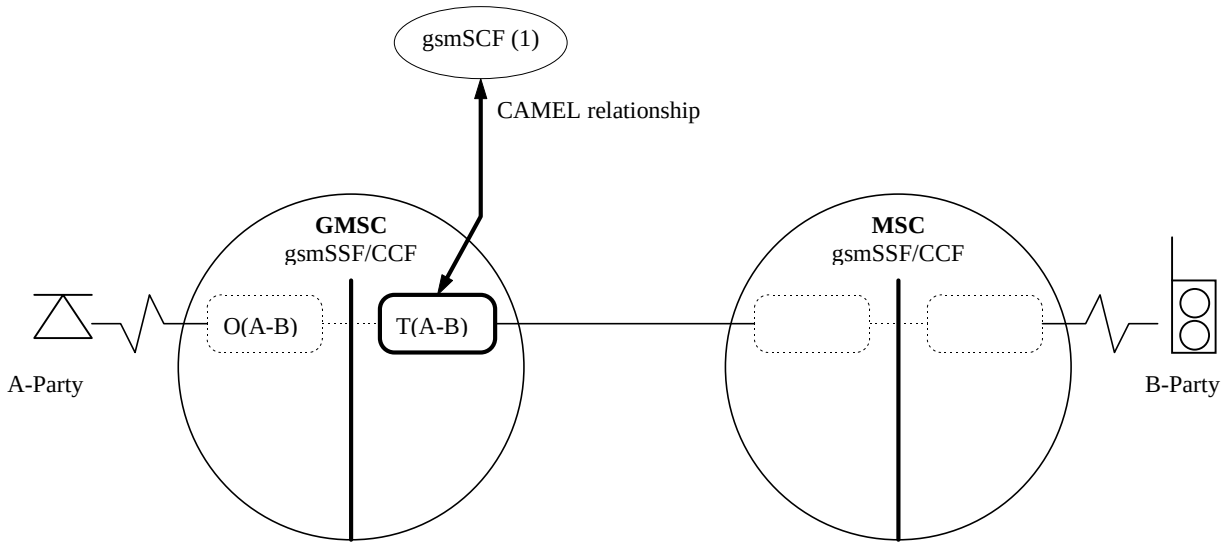

Figure 7.4/2: BCSM Scenario for Mobile Terminated Calls

7.4.3 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 an O-BCSM 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 the forwarding information. In this case an O-BCSM 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.

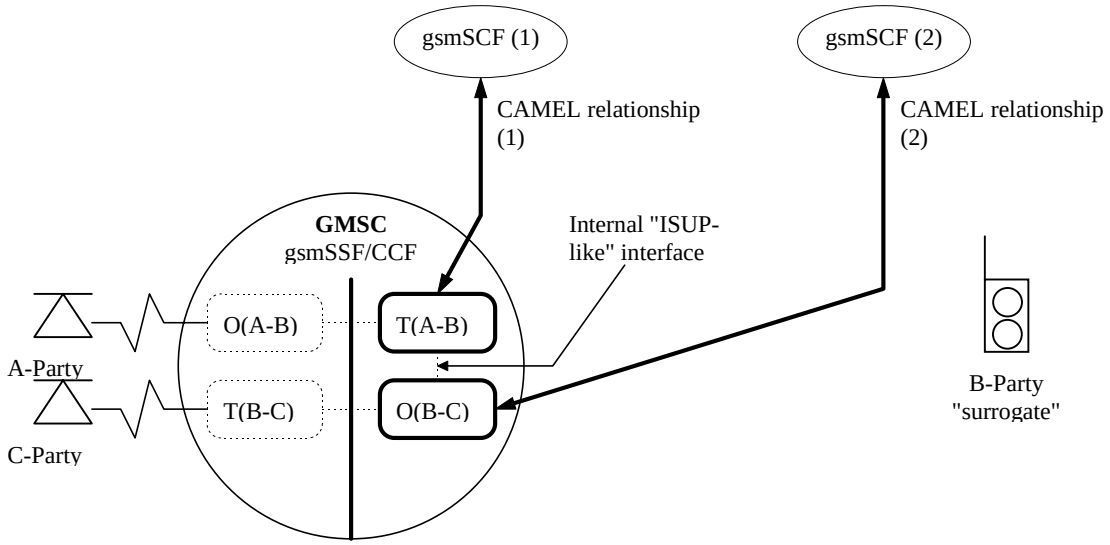

Figure 7.4/3: BCSM Scenario for Call Forwarding at the GMSC

7.4.4 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.

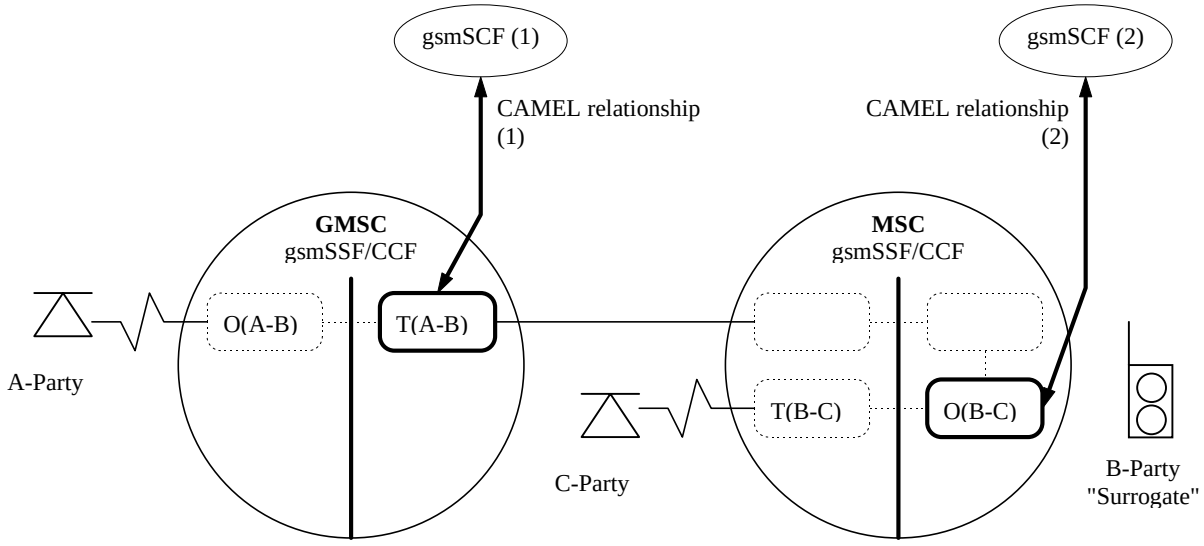

Figure 7.4/4: BCSM Scenario for Call Forwarding at the MSC

8 Procedures for CAMEL

8.1 Handling of mobile originated calls

8.1.1 Handling of mobile originated calls in the originating VMSC

The functional behaviour of the originating VMSC is specified in GSM 03.18 [3]. The procedures specific to CAMEL are specified in this subclause.

8.1.1.1 Procedure CAMEL_OCH_MSC_INIT

A Release_Transaction is sent to the MS and an Abort to the VLR. The release cause received in the Int_Release_Call is used. The procedure returns a Fail result.

8.1.1.1.2 Actions on receipt of Int_Error

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

If the default call handling is to release the call, a Release transaction is sent to the MS and an Abort to the VLR. The procedure returns a Fail result.

If the default call handling is to continue the call, the MSC continues processing without CAMEL support. It 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_2.

8.1.1.1.3 Actions on receipt of Int_Continue

The MSC continues processing without any modification of call parameters. It 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_2.

8.1.1.1.4 Actions 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 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_2.

8.1.1.2 Procedure CAMEL_OCH_MSC_ANSWER

The procedure Send_Access_Connect_If_Required is specified in GSM 03.18 [3].

8.1.1.3 Procedure CAMEL_OCH_MSC_DISC1

8.1.1.4 Procedure CAMEL_OCH_MSC_DISC2

8.1.1.5 Procedure CAMEL_OCH_MSC_DISC3

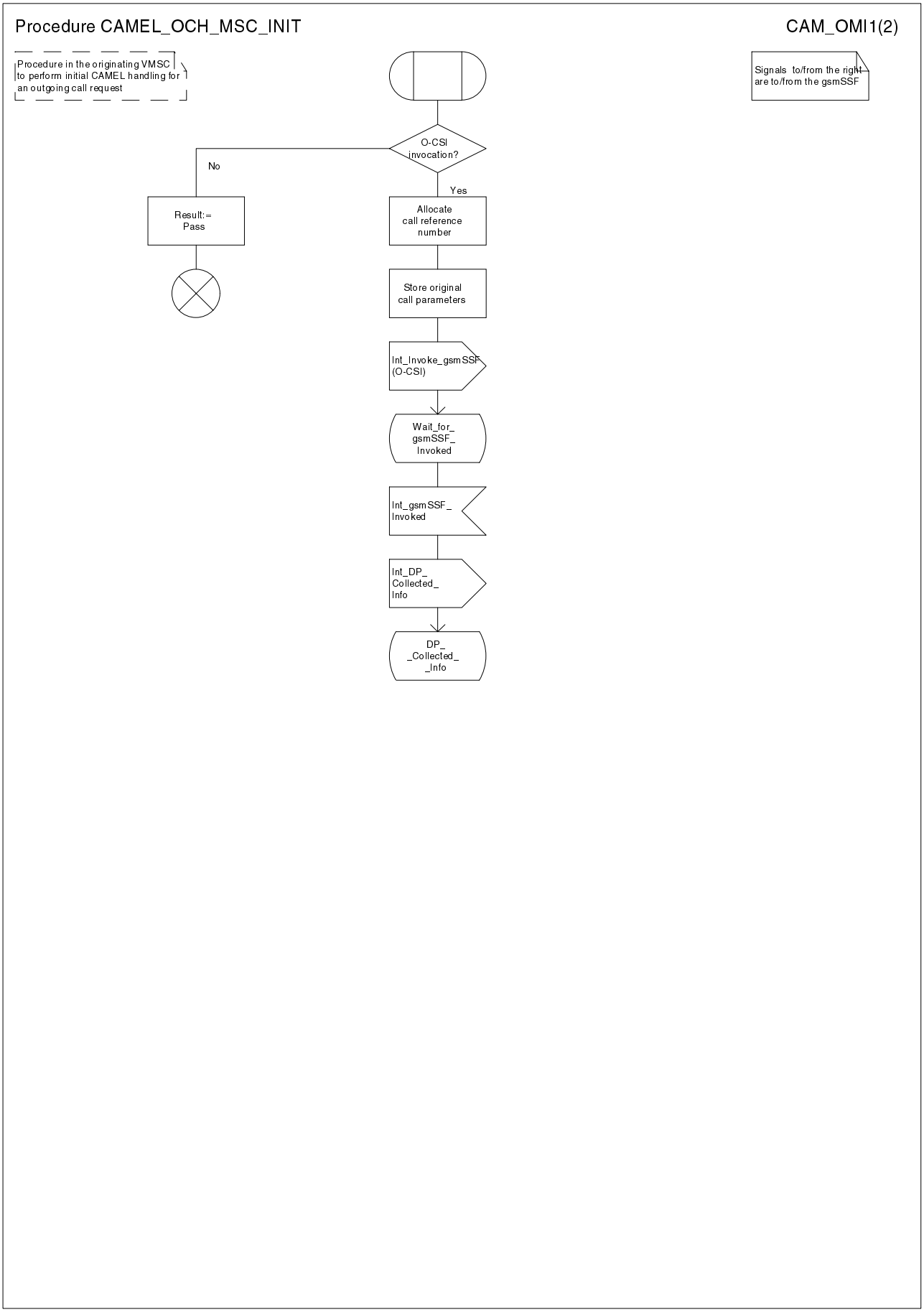

Figure 8.1-1: Procedure CAMEL_OCH_MSC_INIT (sheet 1 of 2)

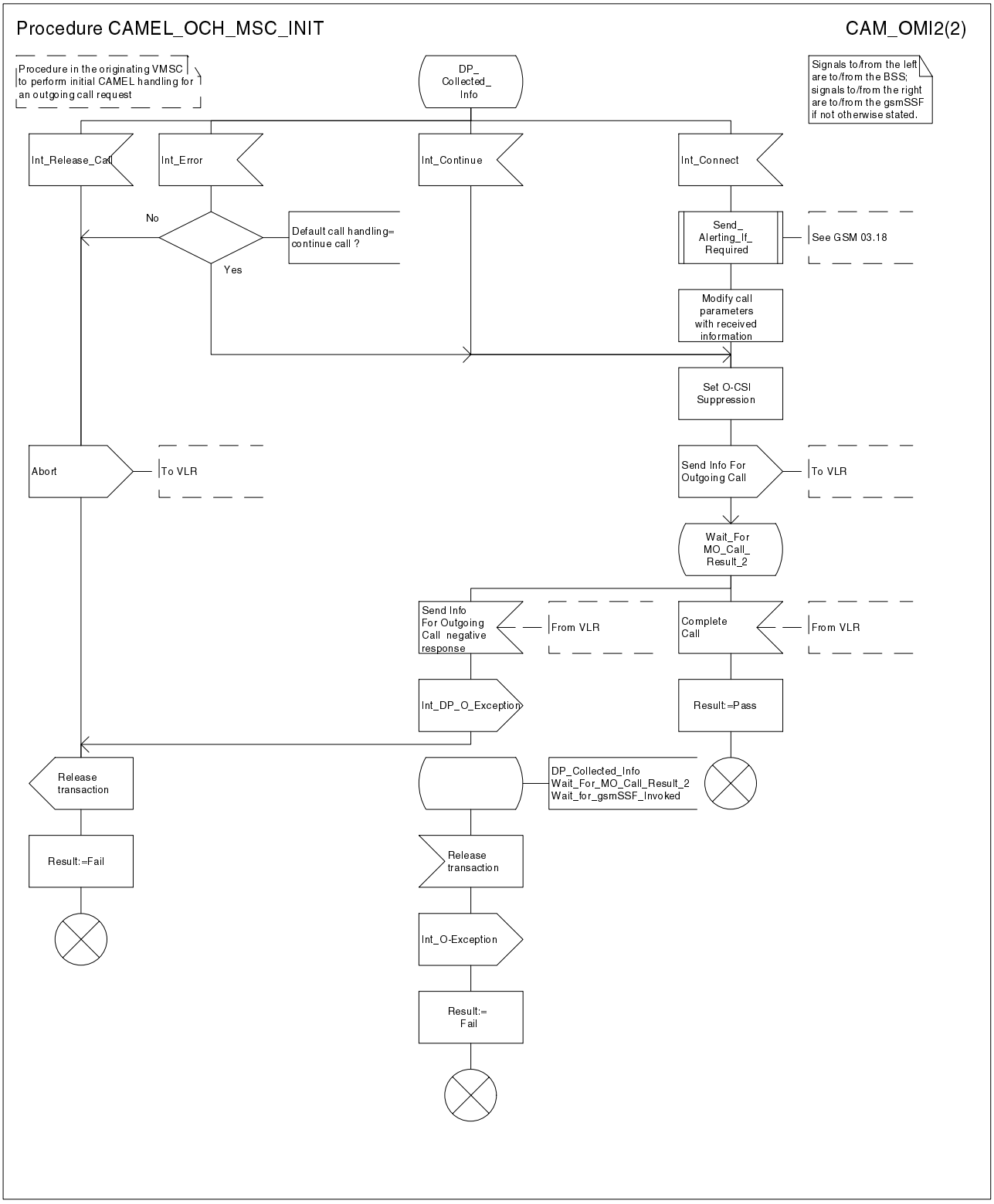

Figure 8.1-2: Procedure CAMEL_OCH_MSC_INIT (sheet 2 of 2)

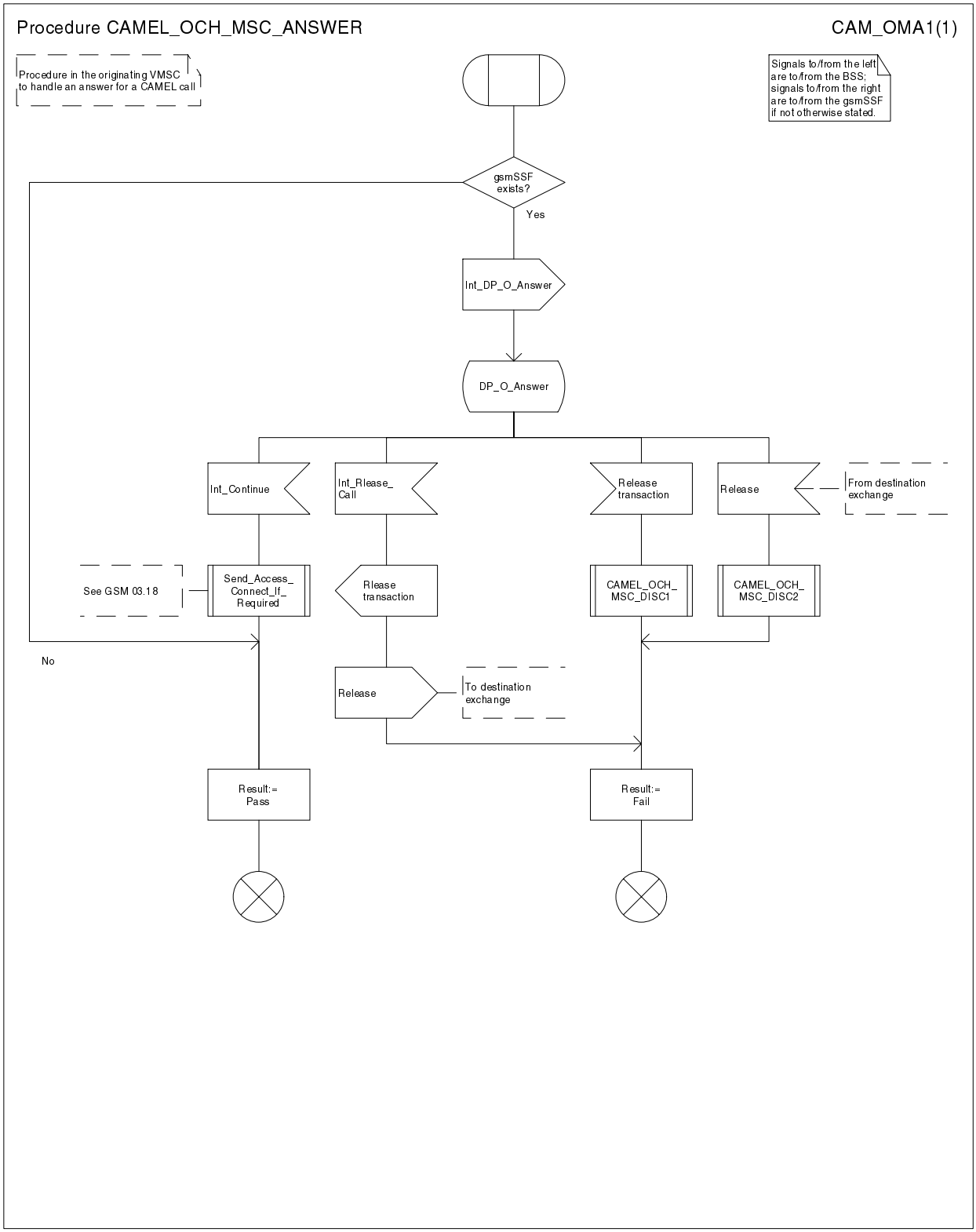

Figure 8.1-3: Procedure CAMEL_OCH_MSC_ANSWER

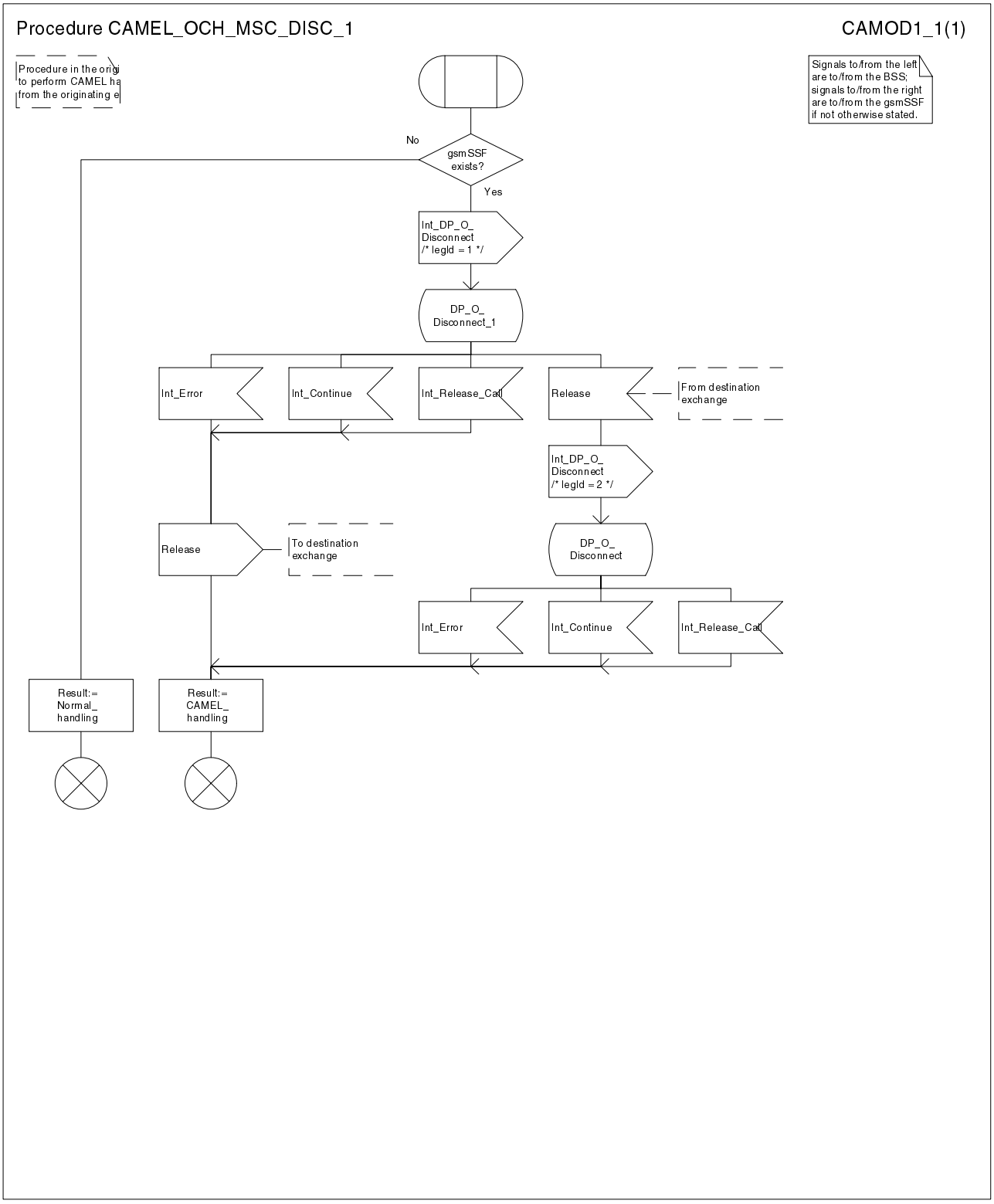

Figure 8.1-4: Procedure CAMEL_OCH_MSC_DISC1

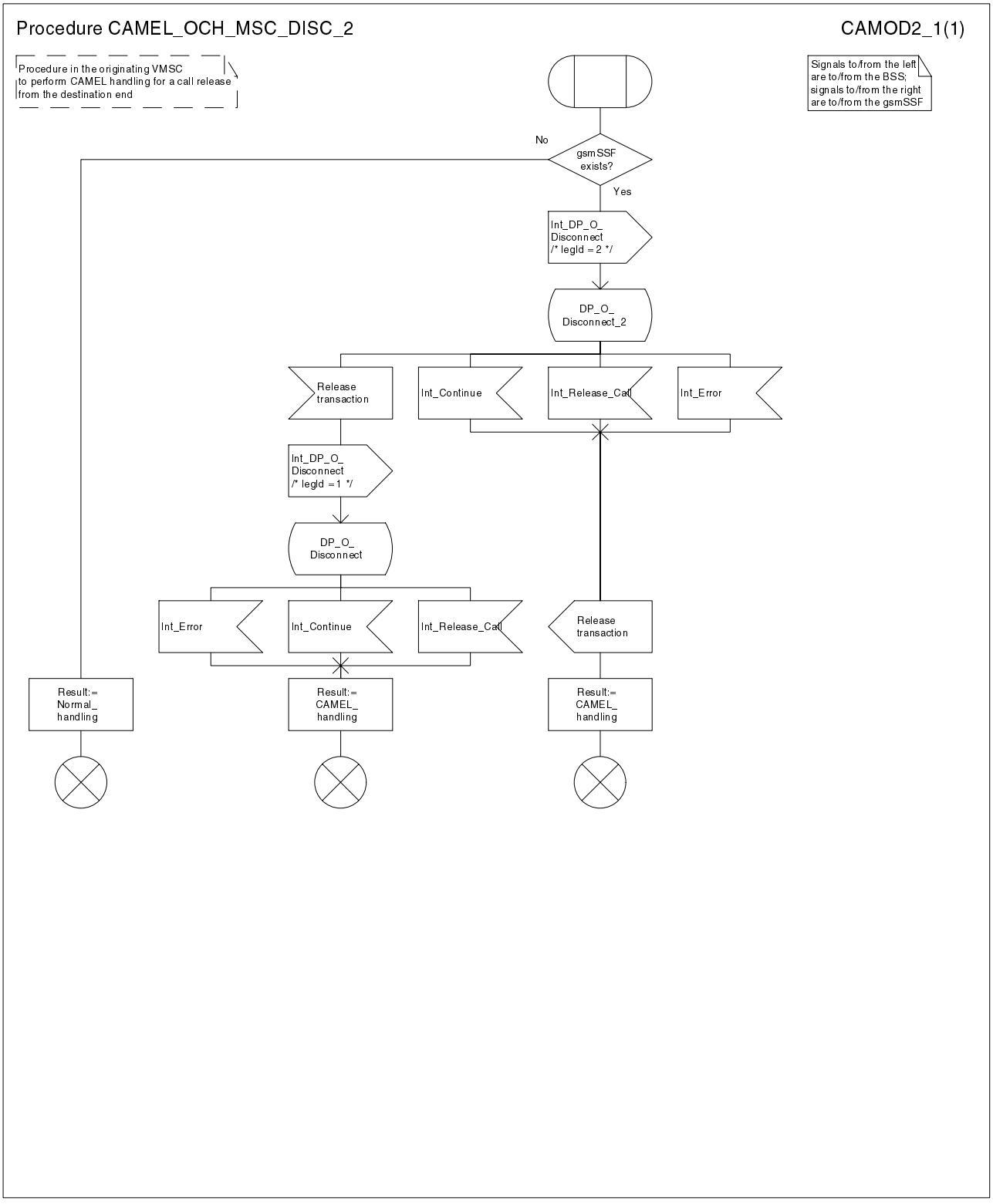

Figure 8.1-5: Procedure CAMEL_OCH_MSC_DISC2

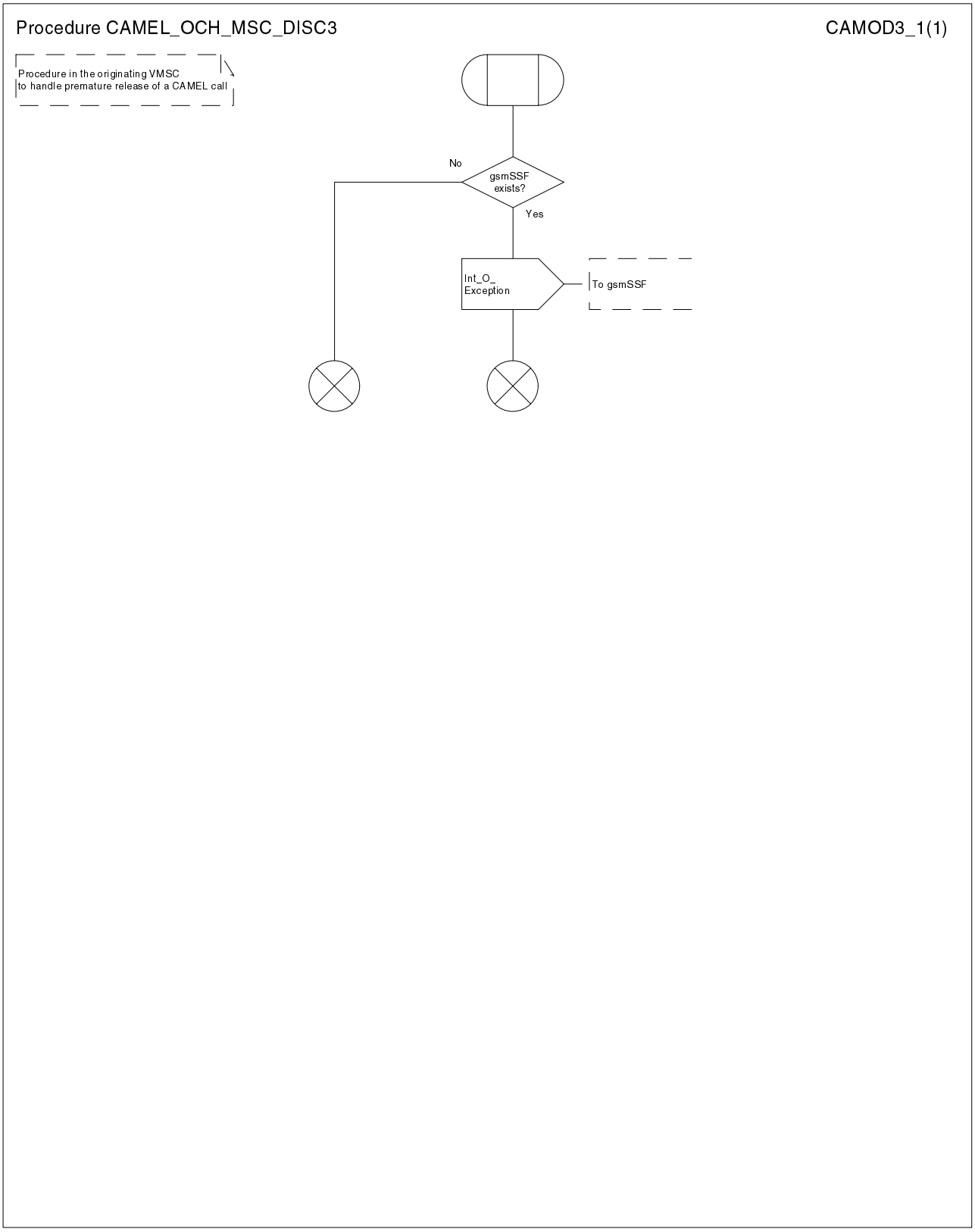

Figure 8.1-6: Procedure CAMEL_OCH_MSC_DISC3

8.1.2 Handling of mobile originated calls in the originating VLR

The functional behaviour of the originating VLR is specified in GSM 03.18 [3]. The procedure specific to CAMEL is specified in this subclause.

8.1.2.1 Procedure CAMEL_OCH_VLR

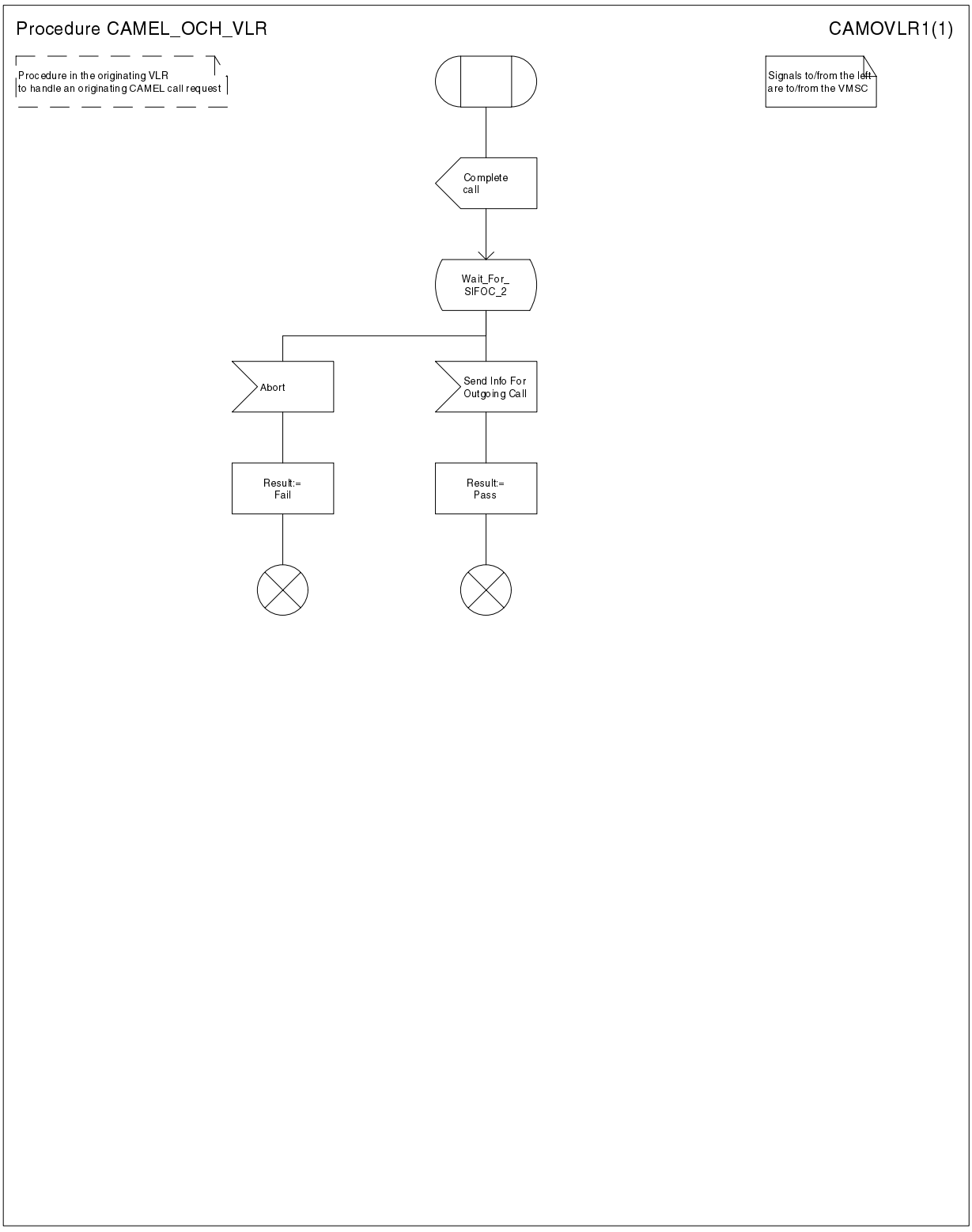

Figure 8.1-7: Procedure CAMEL_OCH_VLR

8.2 Retrieval of routeing information

8.2.1 Retrieval of routeing informationin the GMSC

The functional behaviour of the GMSC is specified in GSM 03.18 [3]. The procedures specific to CAMEL are specified in this subclause.

8.2.1.1 Procedure CAMEL_Set_ORA_Parameters

8.2.1.2 Procedure CAMEL_MT_GMSC_INIT

8.2.1.2.1 Action on receipt of Int_Release_Call

The procedure returns a Fail result.

8.2.1.2.2 Action on receipt of Int_Error

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

If the default call handling is to release the call, the procedure returns a Fail result.

If the default call handling is to continue the call, the GMSC continues call handling without CAMEL support as described in subclause 8.2.1.2.3.

8.2.1.2.3 Action on receipt of Int_Continue

If an FTN has been stored the information received from the HLR is used to overwrite the 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 Routeing Info includes a parameter to indicate which phase of CAMEL is supported by the GMSC/gsmSSF.

8.2.1.2.4 Action on receipt of Int_Connect

The GMSC shall send an ACM towards the originating exchange in order to stop any call timers. The procedure Send_ACM_If_Required is specified in GSM 03.18 [3].

If the Destination Number received from the gsmSCF (via the gsmSSF) is the same as the ISUP Called Party Number, i.e. the MSISDN, any other parameters (Calling Partys Category and Generic Number) received in the Connect message are used to overwrite the corresponding ISUP parameters (for mapping see GSM 09.78 [6]). If received, the Announcement Suppression Indicator is stored. The further processing is described in subclause 8.2.1.2.3 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, and the procedure returns a Fail result.

Otherwise the following parameters, if received, are used to overwrite the corresponding ISUP parameters (for mapping see GSM 09.78 [6]): Destination Number, Calling Partys Category, Generic Number, Original Called Party ID, Redirecting Party ID and Redirection Information. Call parameters which are not included in the Int_Connect message are unchanged.

As a network 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.

8.2.1.2.5 Send Routeing Info negative response in 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. The procedure returns a Fail result.

8.2.1.2.6 Send Routeing Info ack with MSRN in state Wait_For_Routeing_Info_2

The procedure returns the MSRN as the result.

8.2.1.2.7 Send Routeing Info ack with FTN in state Wait_For_Routeing_Info_2

The redirection counter is incremented. The procedure returns the FTN as the result.

8.2.1.2.8 Send Routeing Info ack with O-CSI and FTN in state Wait_For_Routeing_Info_2

The redirection counter is incremented. The procedure returns the FTN as the result. The O-CSI is passed to the process MT_CF_MSC in the Perform Call Forwarding request.

8.2.1.3 Procedure CAMEL_MT_GMSC_ANSWER

8.2.1.4 Procedure CAMEL_MT_GMSC_DISC1

8.2.1.5 Procedure CAMEL_MT_GMSC_DISC2

8.2.1.6 Procedure CAMEL_MT_GMSC_DISC3

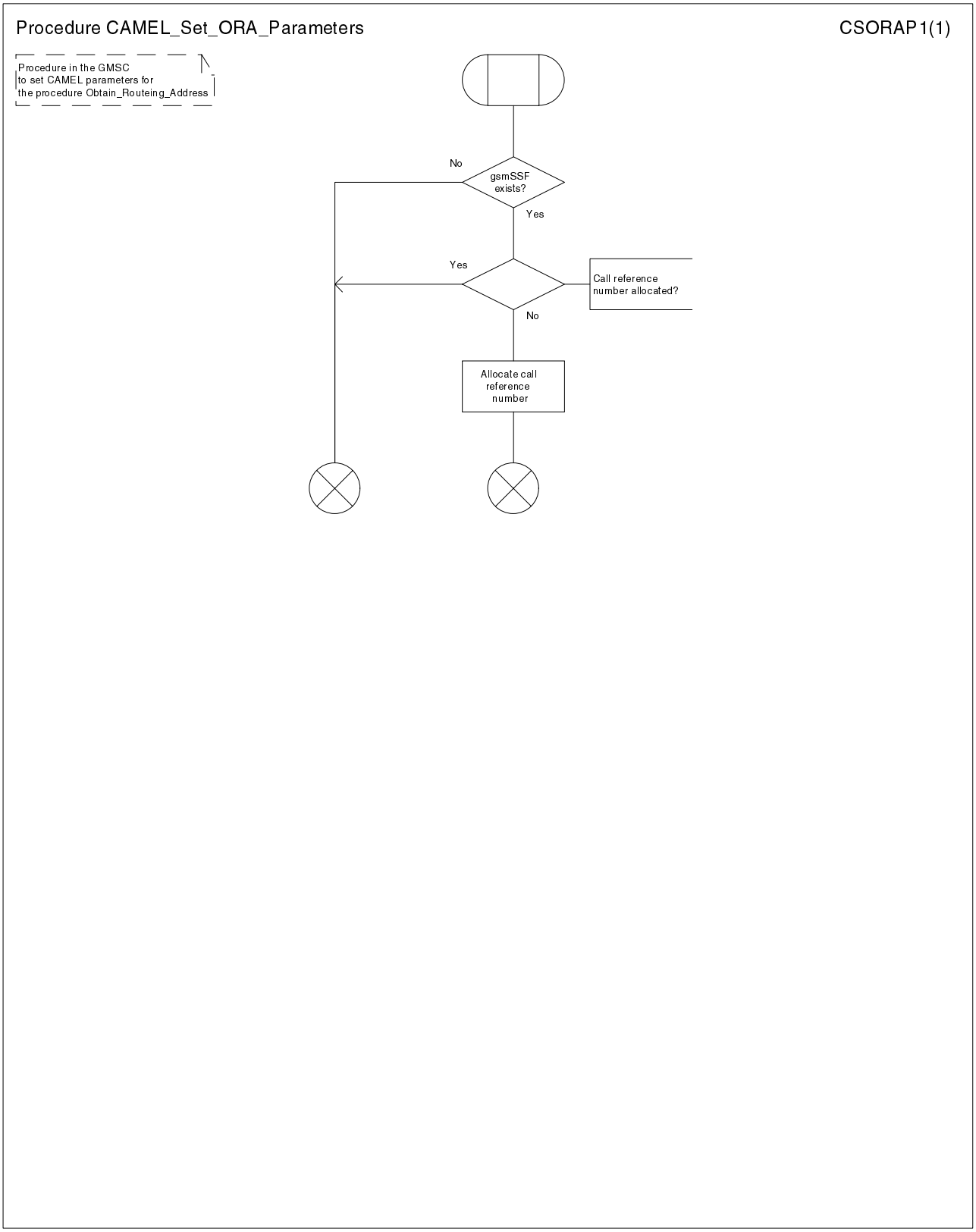

Figure 8.2-1: Procedure CAMEL_Set_ORA_Parameters

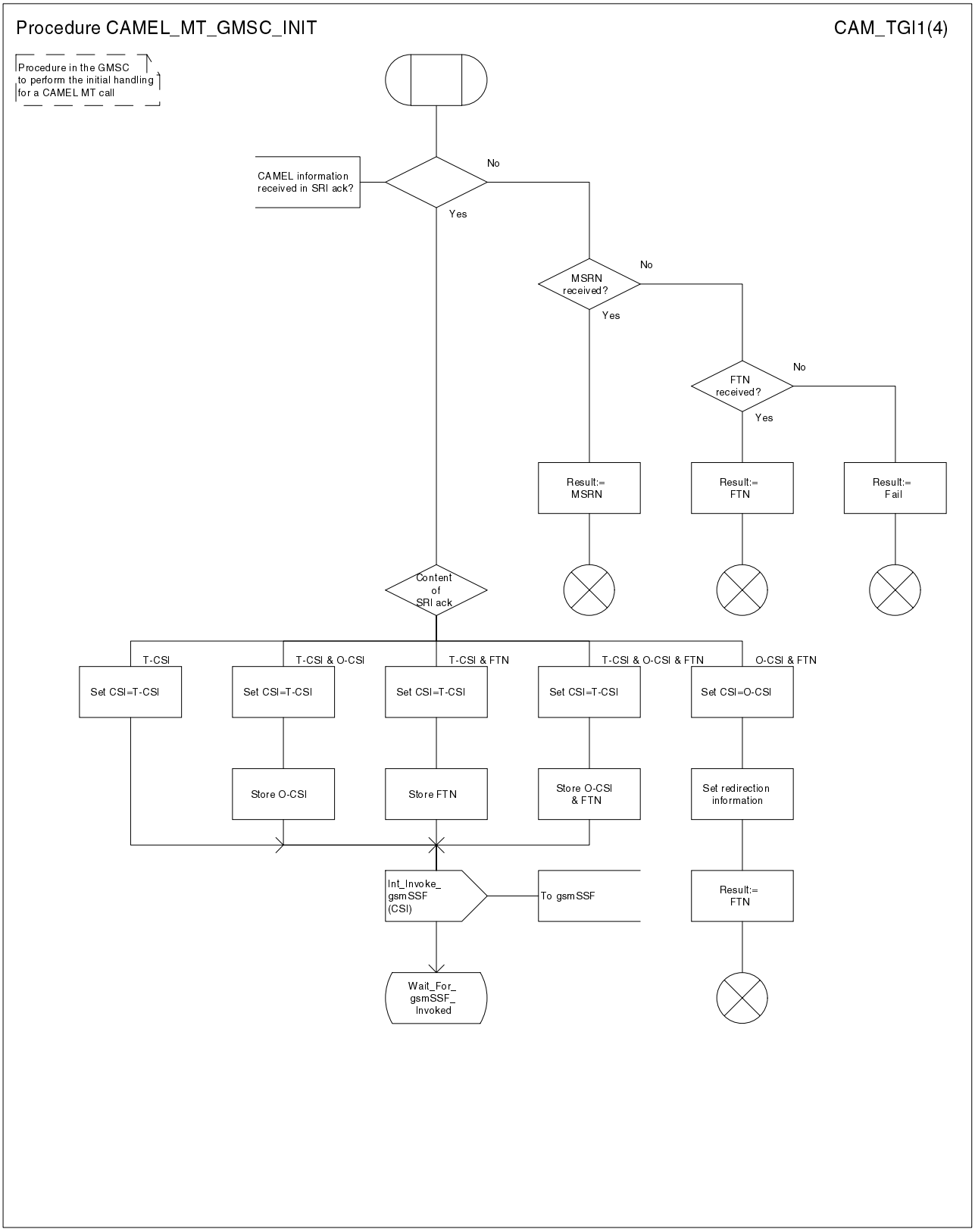

Figure 8.2-2: Procedure CAMEL_MT_GMSC_INIT (sheet 1 of 4)

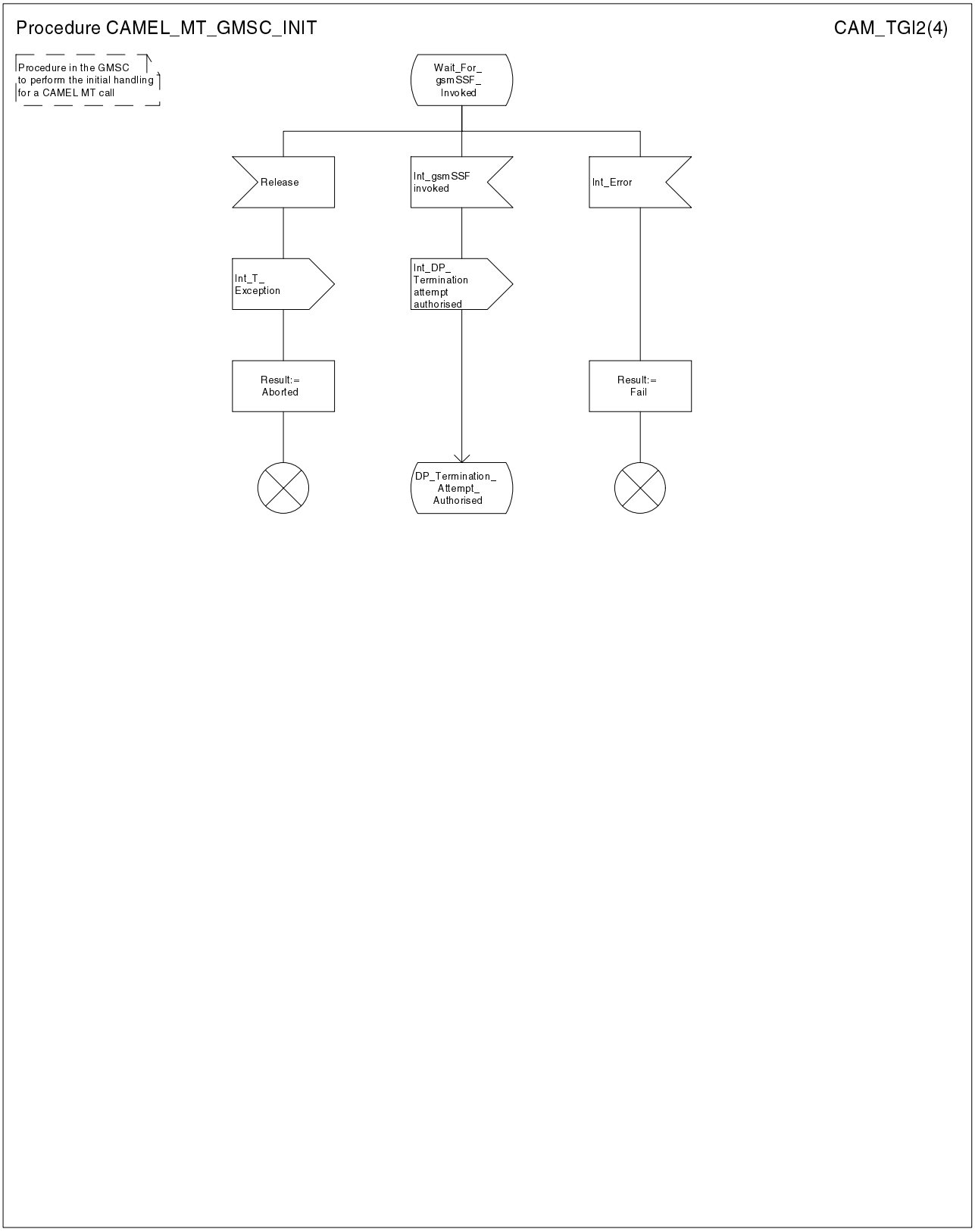

Figure 8.2-3: Procedure CAMEL_MT_GMSC_INIT (sheet 2 of 4)

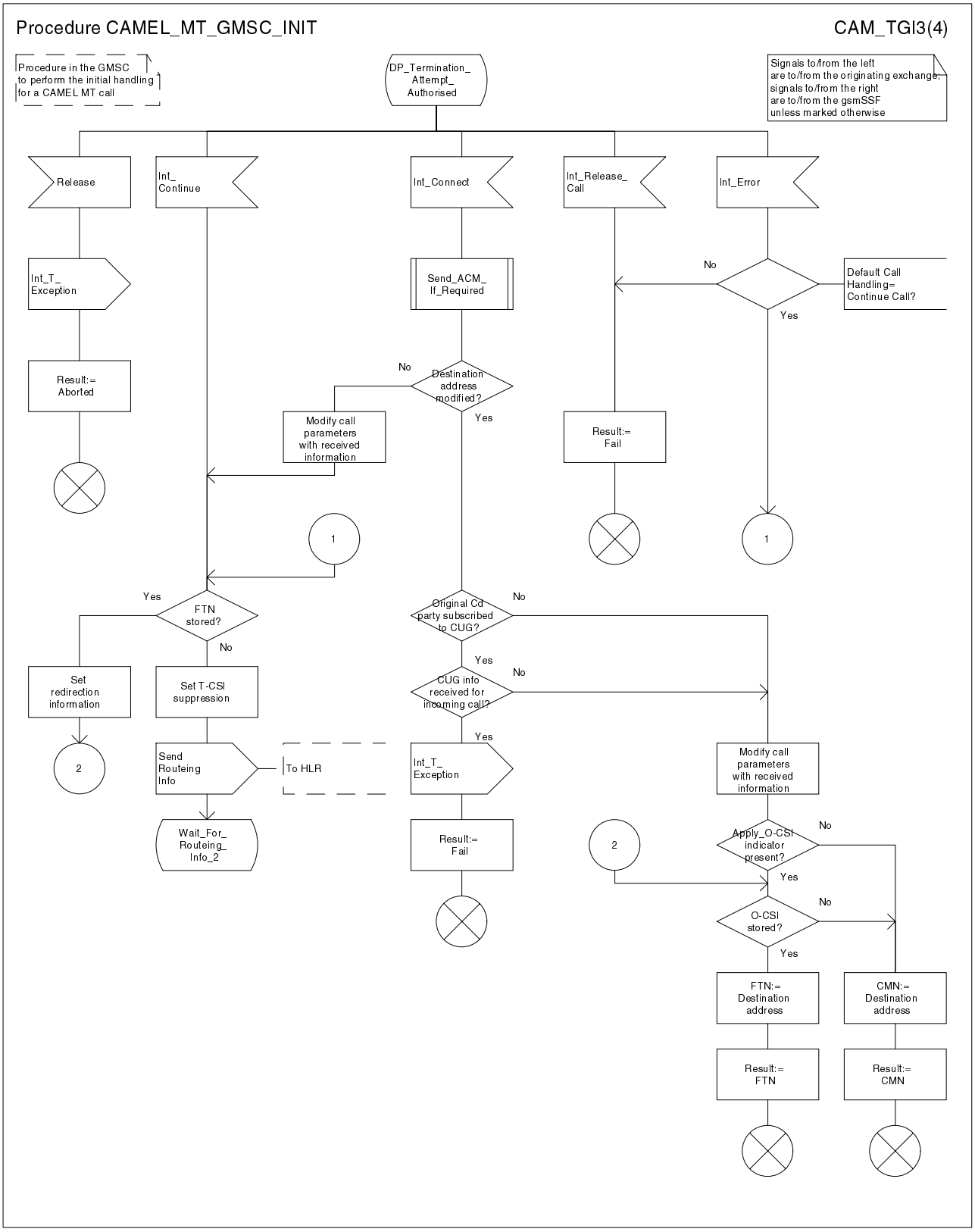

Figure 8.2-4: Procedure CAMEL_MT_GMSC_INIT (sheet 3 of 4)

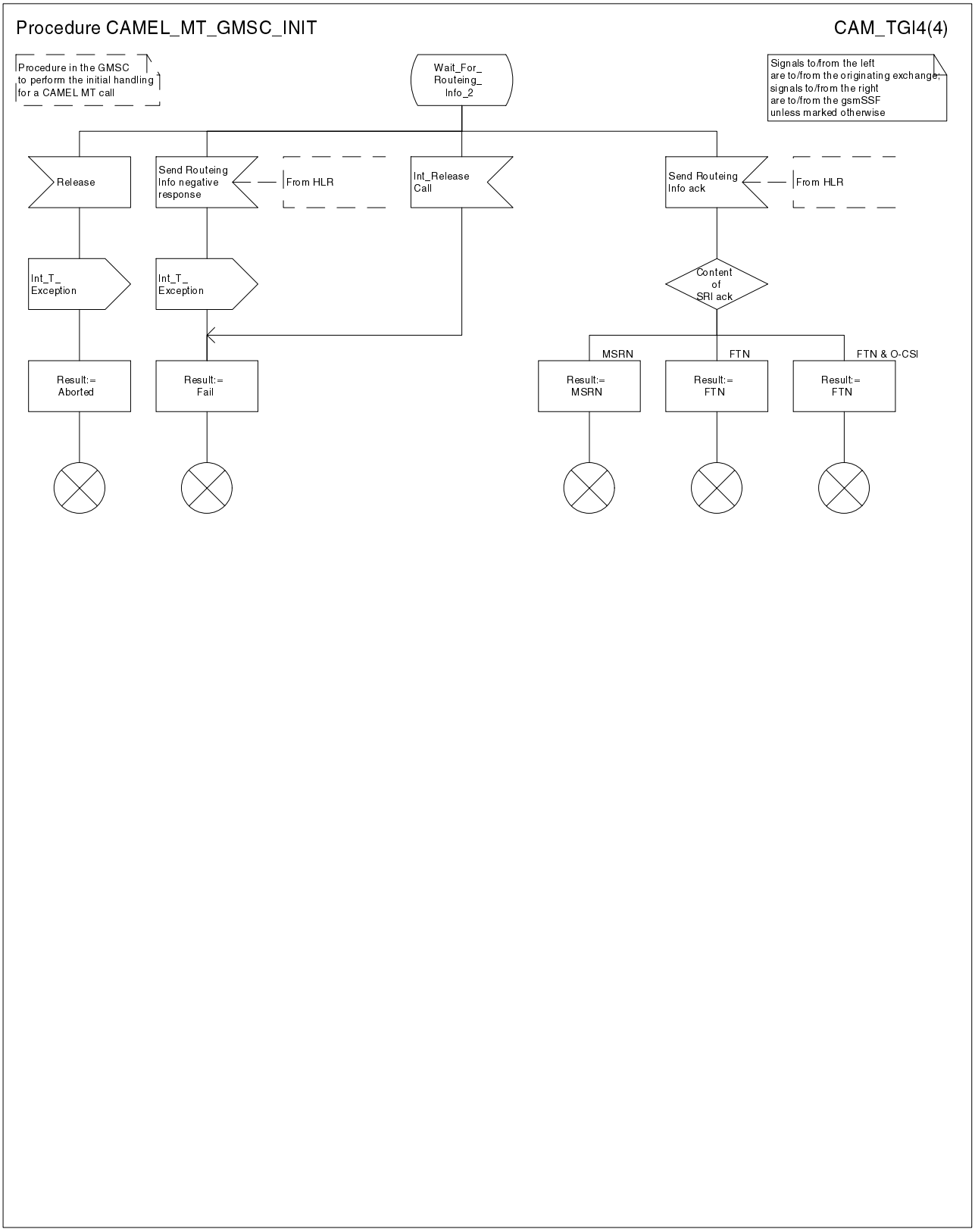

Figure 8.2-5: Procedure CAMEL_MT_GMSC_INIT (sheet 4 of 4)

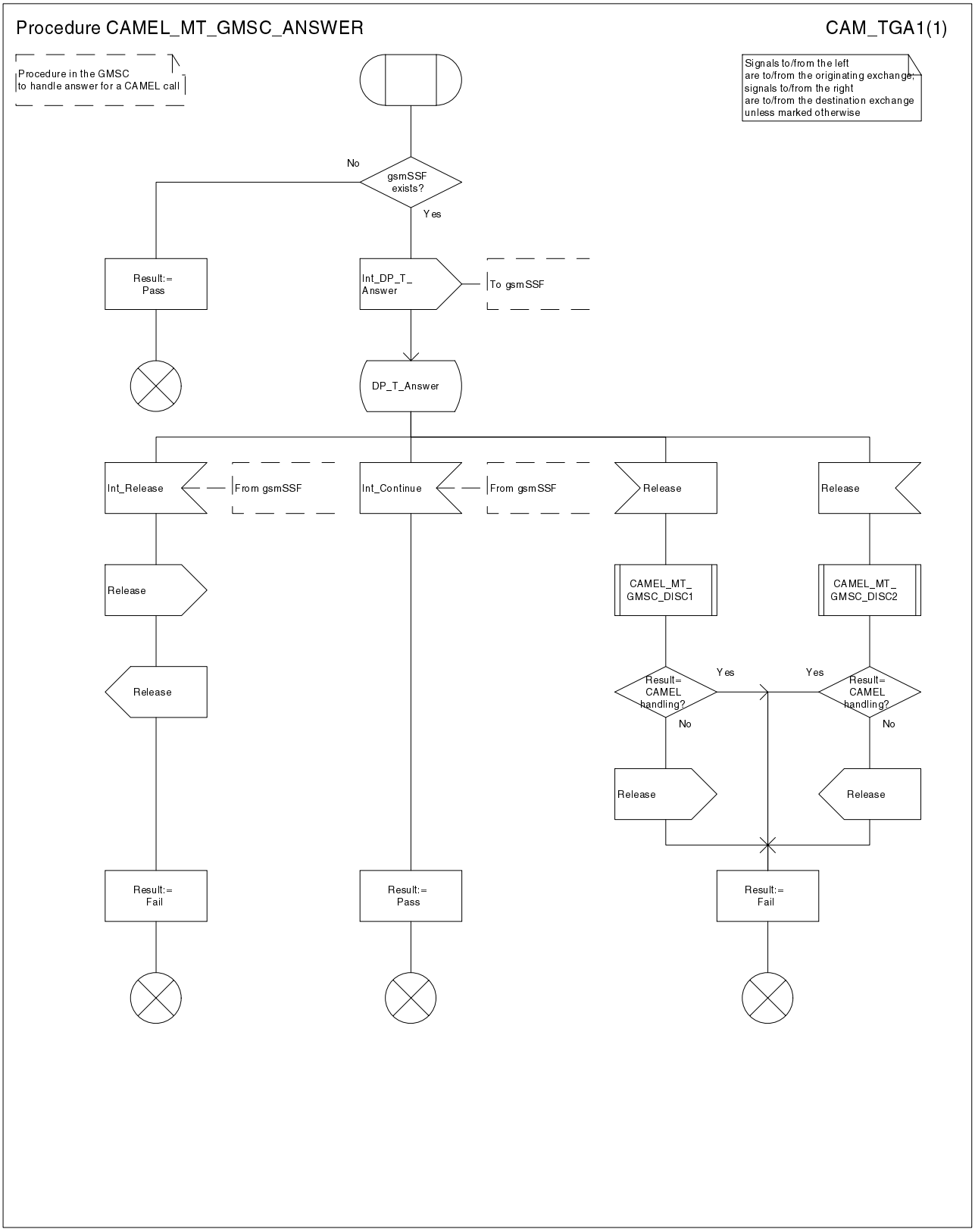

Figure 8.2-6: Procedure CAMEL_MT_GMSC_ANSWER

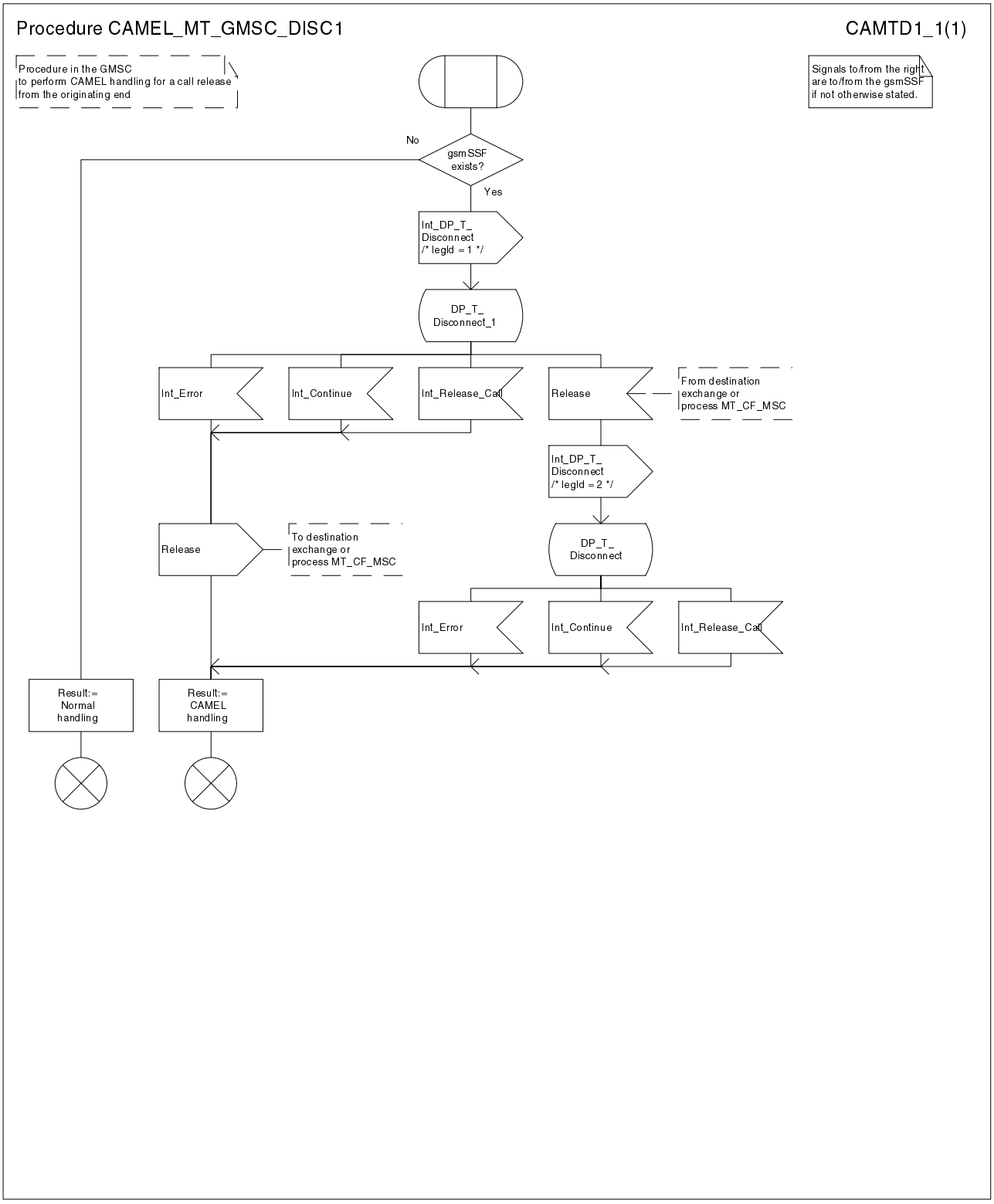

Figure 8.2-7: Procedure CAMEL_MT_GMSC_DISC1

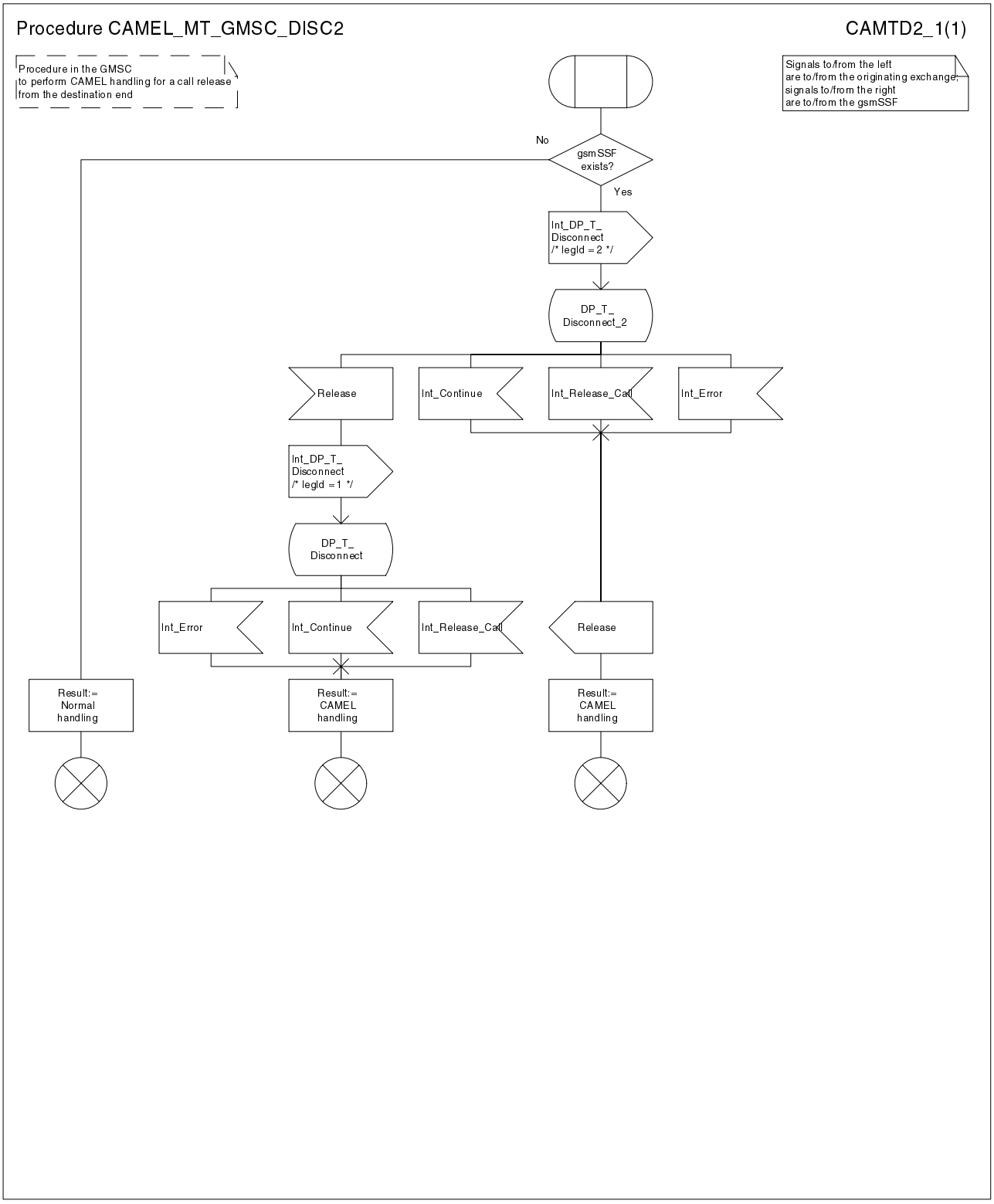

Figure 8.2-8: Procedure CAMEL_MT_GMSC_DISC2

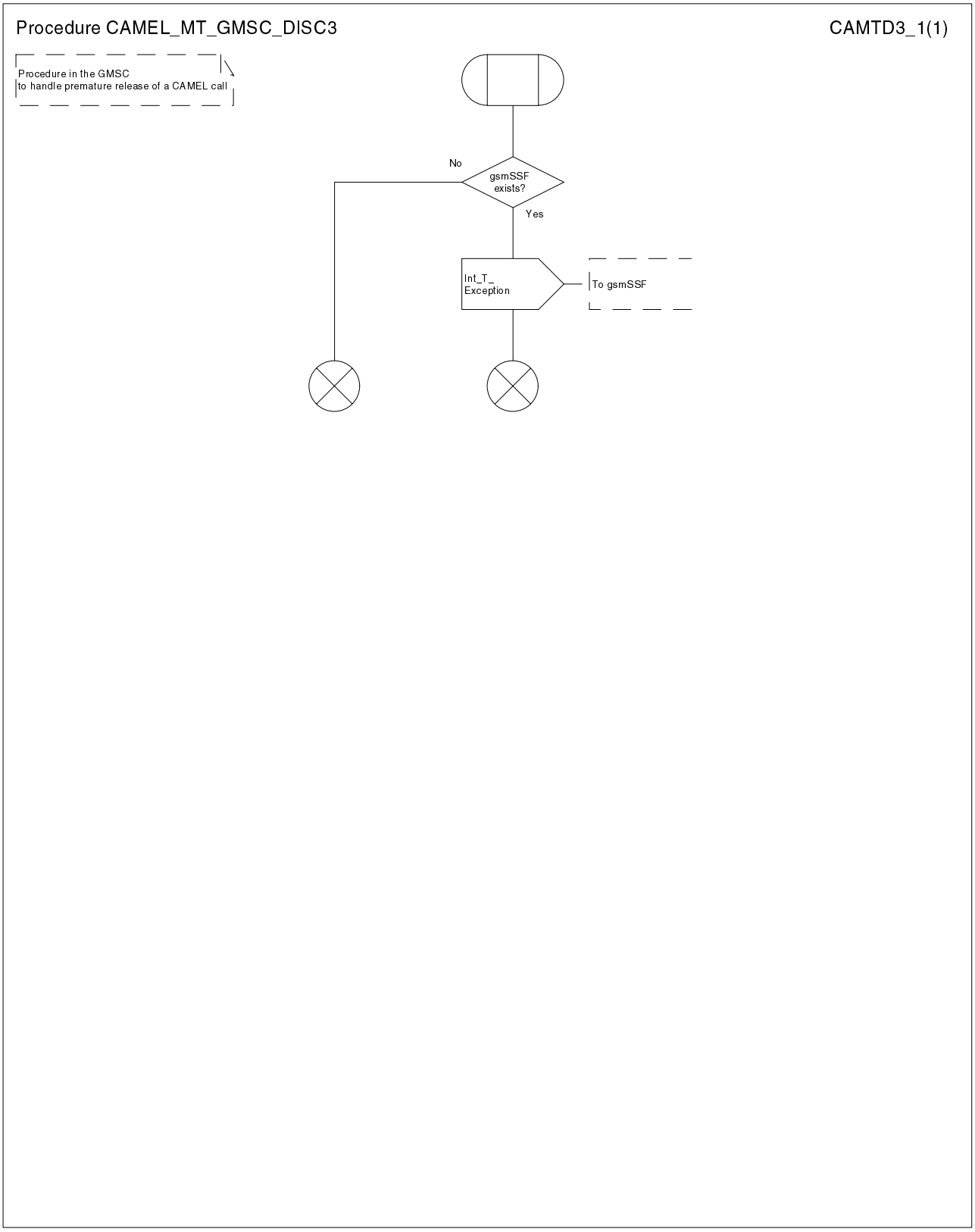

Figure 8.2-9: Procedure CAMEL_MT_GMSC_DISC3

8.2.2 Retrieval of routeing information in the HLR

The functional behaviour of the HLR is specified in GSM 03.18 [3]. The procedures specific to CAMEL are specified in this subclause.

8.2.2.1 Procedure CAMEL_HLR_INIT

8.2.2.2 Procedure CAMEL_CSI_Check_HLR

8.2.2.3 Procedure CAMEL_T_CSI_CHECK_HLR

The procedure Provide_Subscriber_Info_HLR is specified in subclause 8.7.

8.2.2.4 Procedure CAMEL_O_CSI_CHECK_HLR

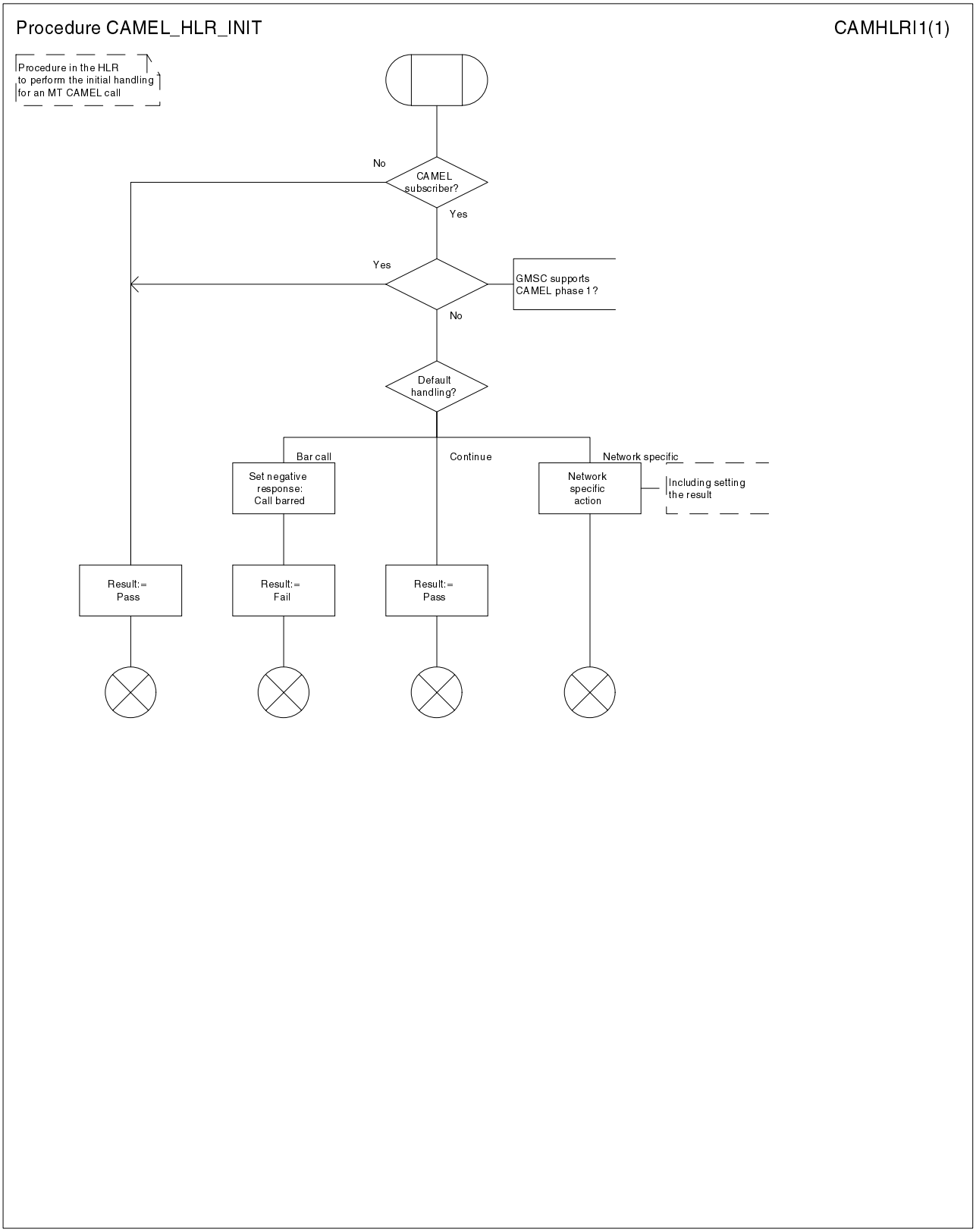

Figure 8.2-8: Procedure CAMEL_HLR_INIT

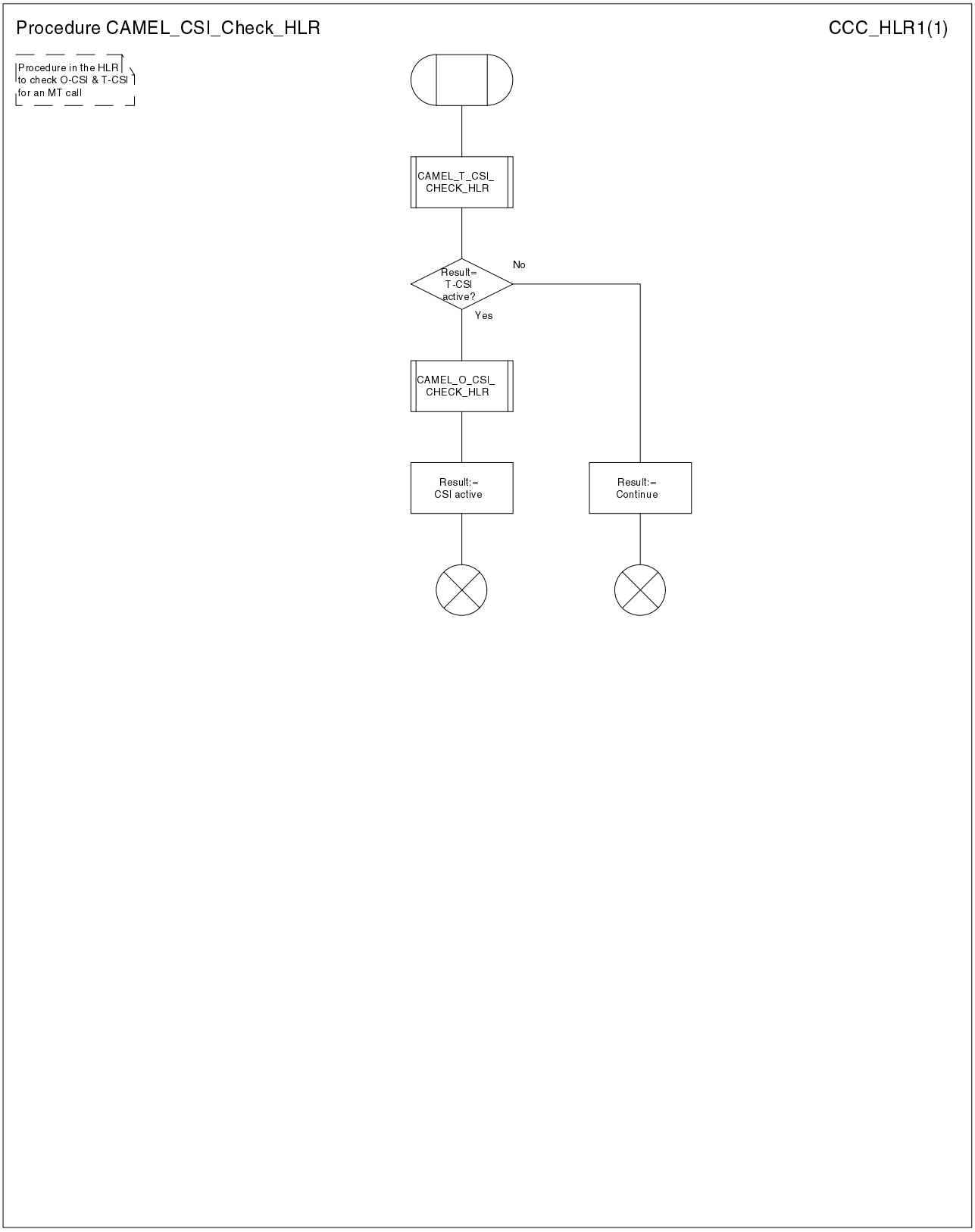

Figure 8.2-9: Procedure CAMEL_CSI_Check_HLR

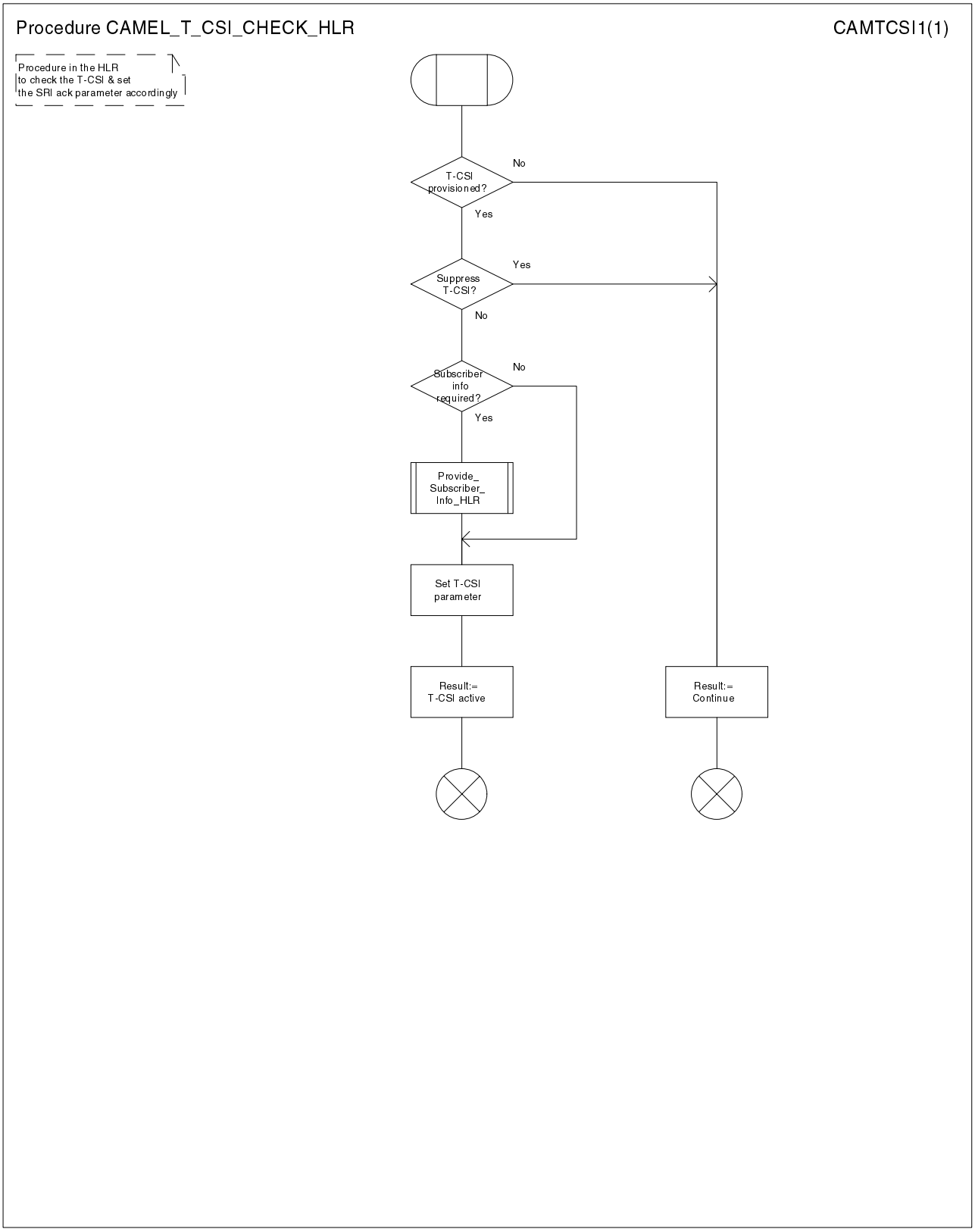

Figure 8.2-10: Procedure CAMEL_T_CSI_CHECK_HLR

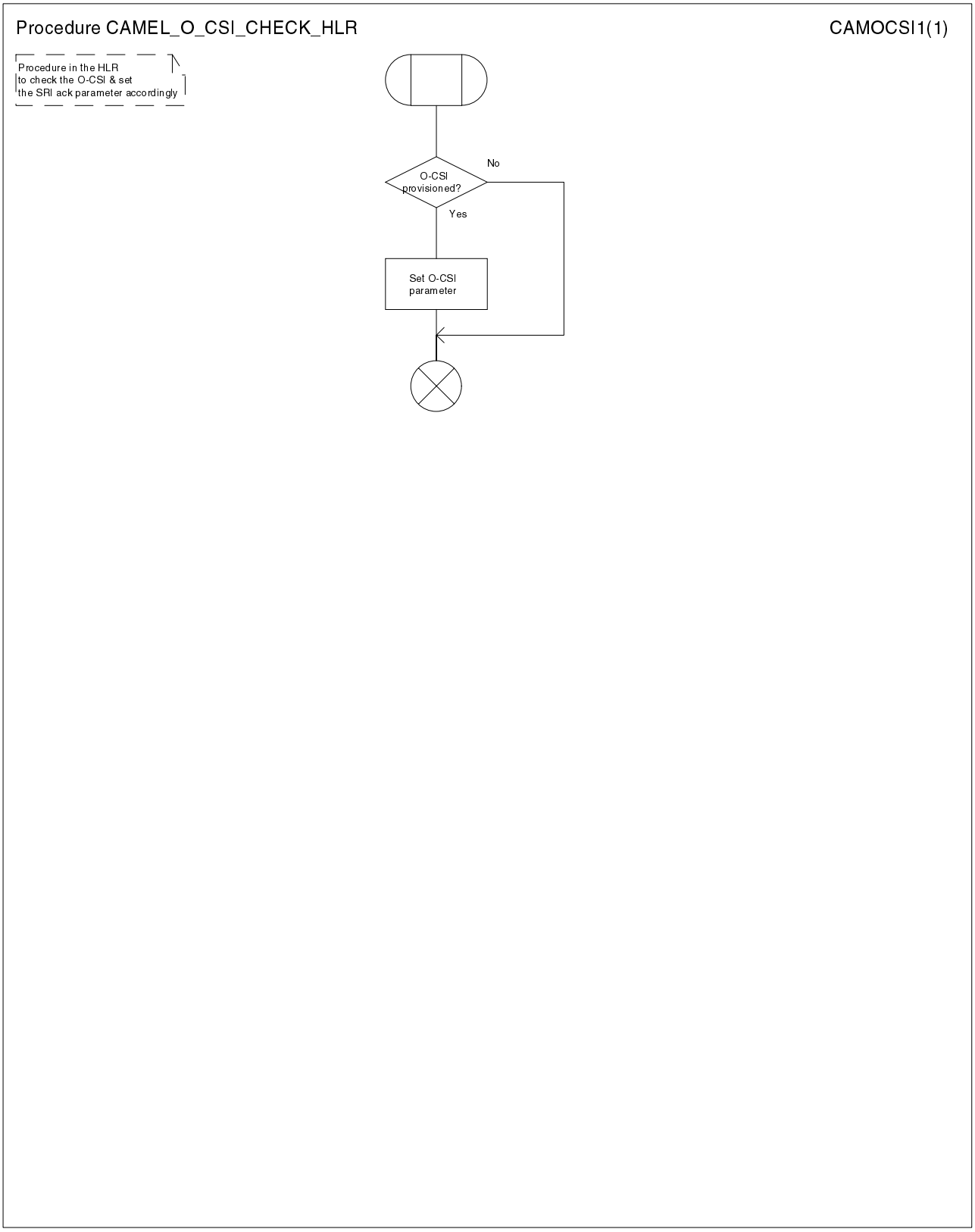

Figure 8.2-11: Procedure CAMEL_O_CSI_CHECK_HLR

8.2.3 Handling of provide roaming number request in the VLR

The functional behaviour of the VLR is specified in GSM 03.18 [3]. The procedure specific to CAMEL is specified in this subclause.

8.2.3.1 Procedure CAMEL_SET_SOA

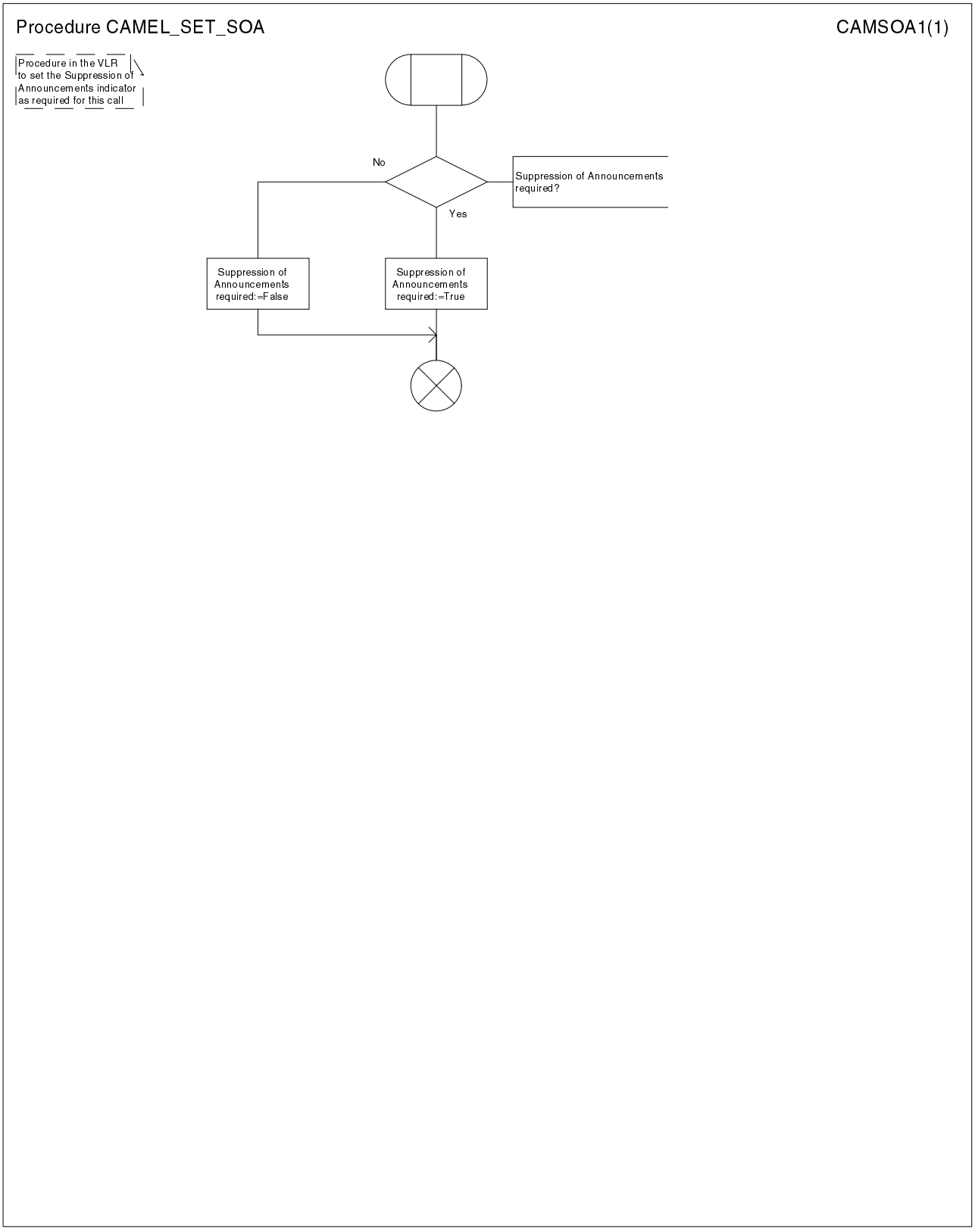

Figure 8.2-16: Procedure CAMEL_SET_SOA

8.3 Handling of mobile terminated calls

8.3.1 Handling of mobile terminated calls handling in the terminating VMSC

The functional behaviour of the terminating VMSC is specified in GSM 03.18 [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 ack or Send Info For Incoming Call negative response.

8.3.2 Handling of mobile terminated calls in the terminating VLR

The functional behaviour of the terminating VLR is specified in GSM 03.18 [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;

- as an implementation option, the inclusion of the suppression of announcements parameter in the Send Info For Incoming Call ack if it was received in the Provide Roaming Number.

- 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.

8.4 Handling of forwarded calls

The handling of forwarded calls in the GMSC or the terminating VMSC is specified in GSM 03.18 [3]. The procedures specific to CAMEL are specified in this subclause.

8.4.1 Procedure CAMEL_CF_INIT

Sheet 3: the parameters received in the Int_Connect message are used to overwrite the corresponding ISUP parameters (for mapping see GSM 09.78 [6]). Call parameters which are not included in the Int_Connect message are unchanged.

As a network 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.

8.4.2 Procedure CAMEL_CF_ANSWER

The procedures CAMEL_OCH_MSC_DISC1 & CAMEL_OCH_MSC_DISC2 are specified in subclauses 8.1.1.3 & 8.1.1.4 respectively.

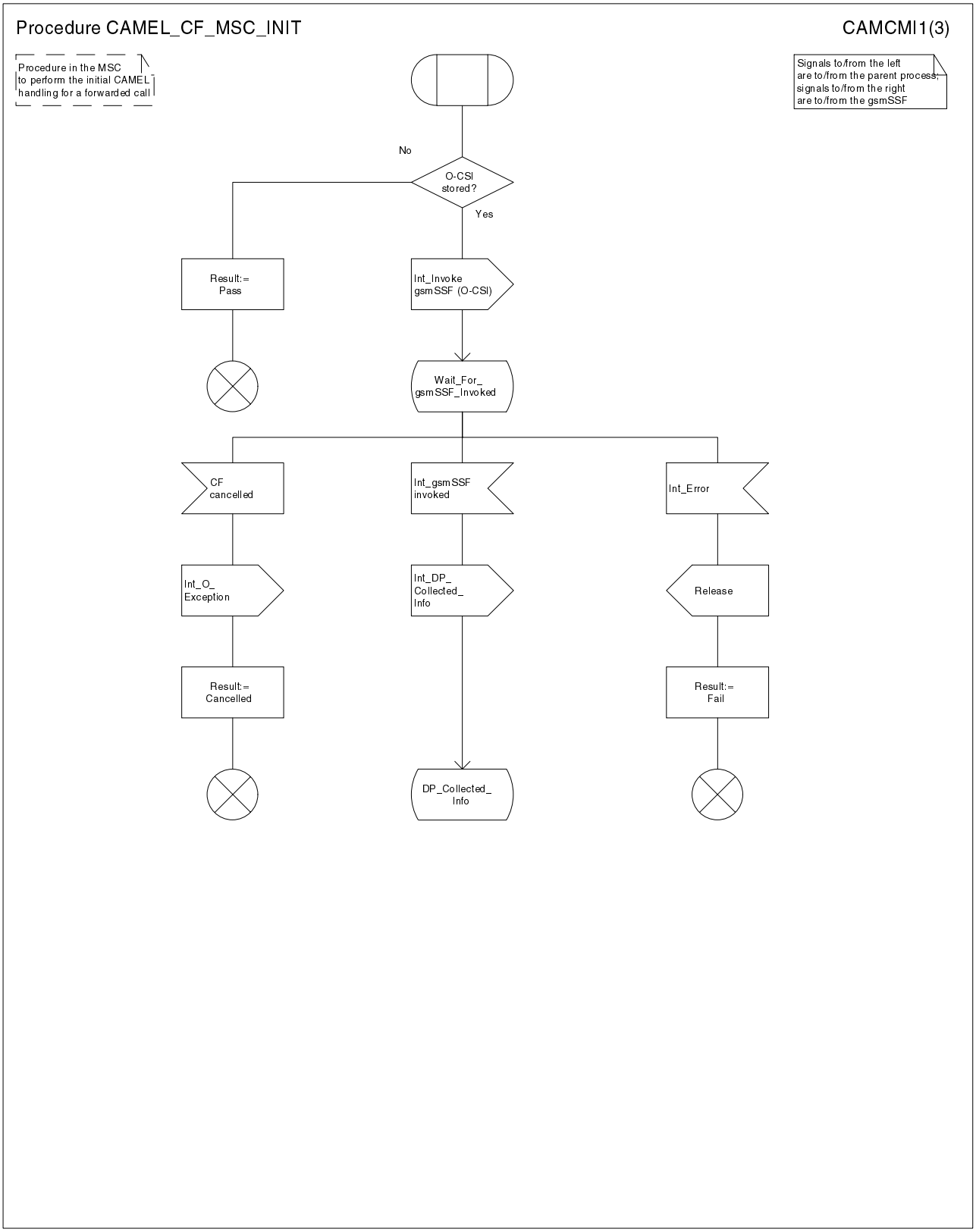

Figure 8.4-1: Procedure CAMEL_CF_MSC_INIT (sheet 1 of 3)

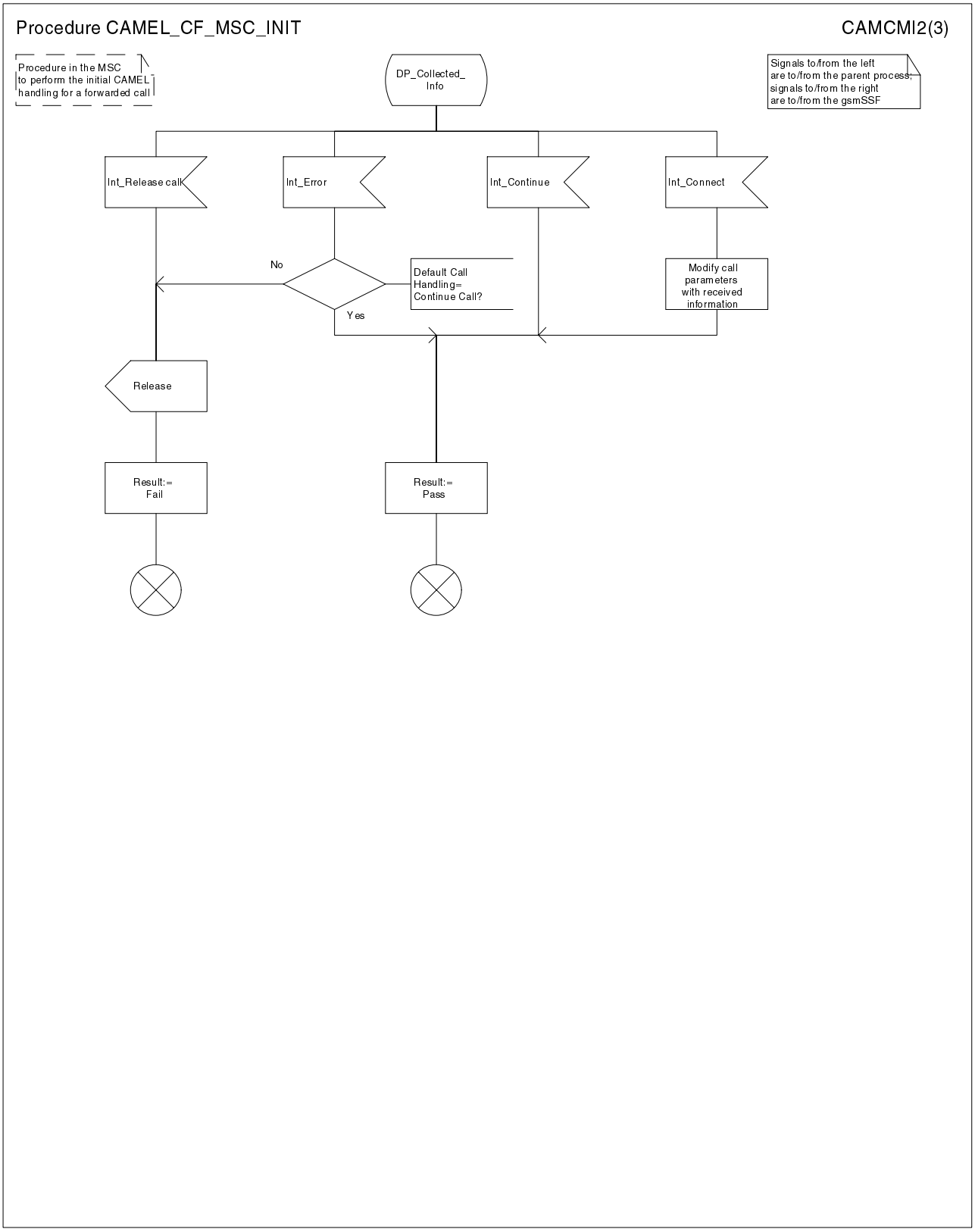

Figure 8.4-2: Procedure CAMEL_CF_MSC_INIT (sheet 2 of 3)

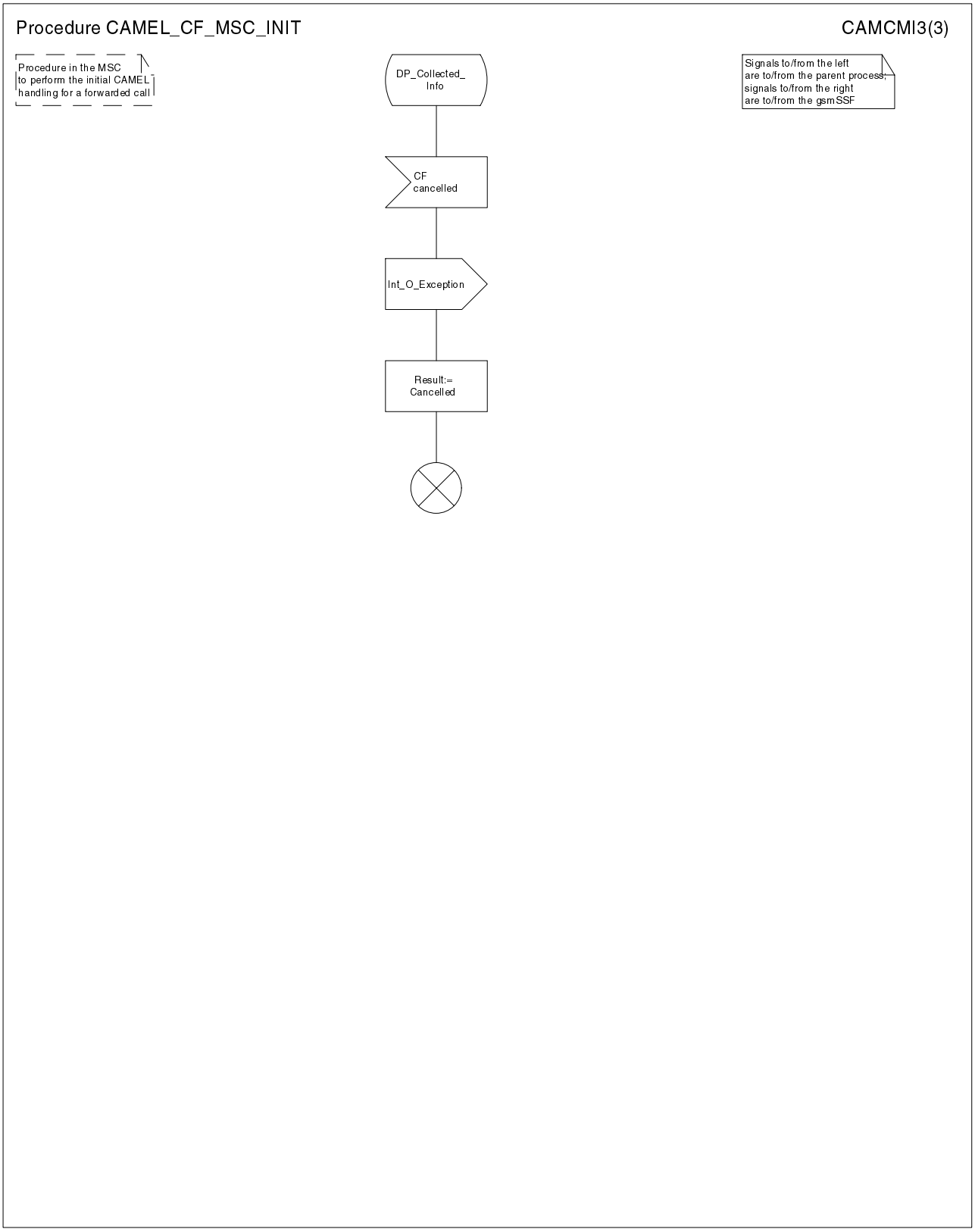

Figure 8.4-3: Procedure CAMEL_CF_MSC_INIT (sheet 3 of 3)

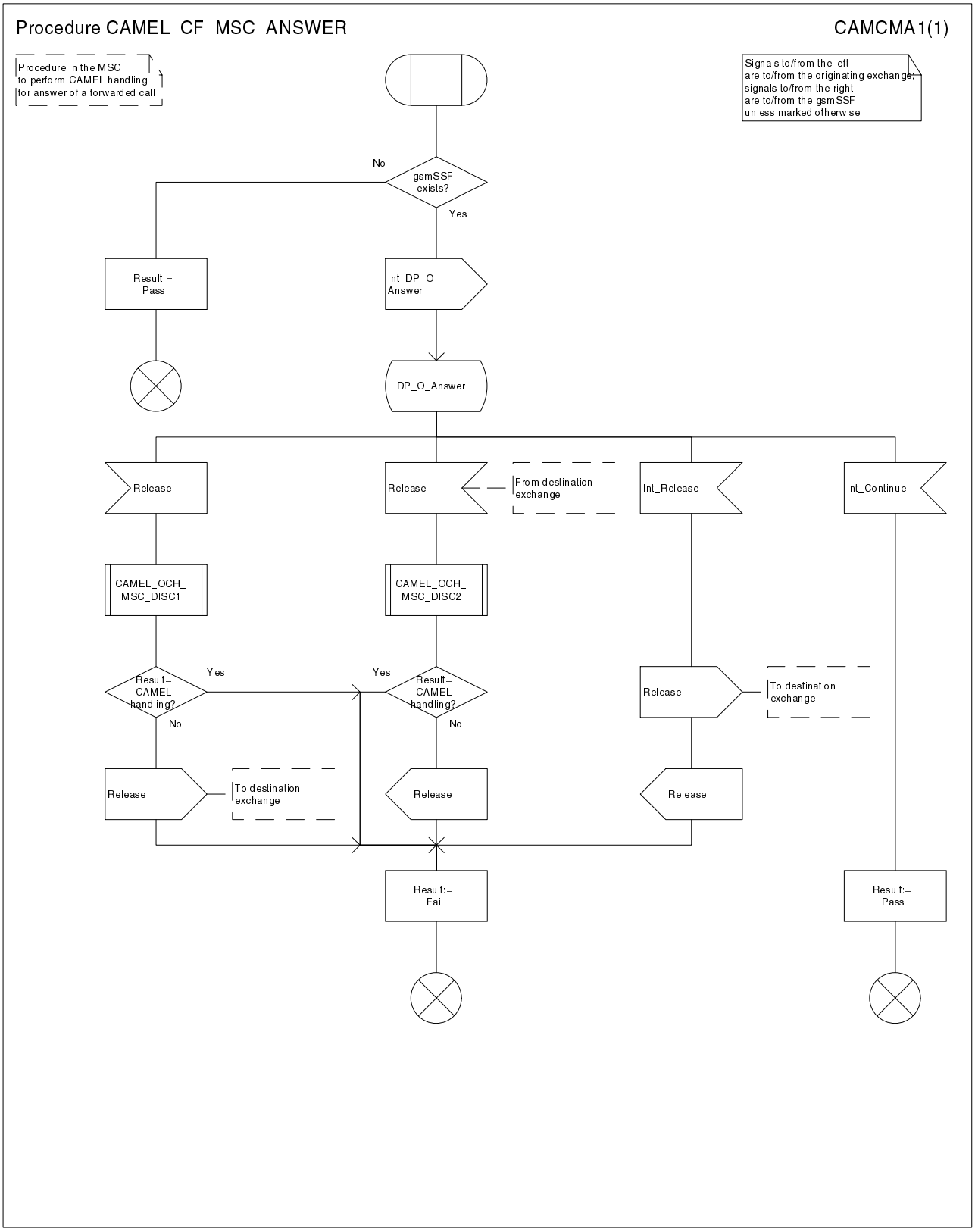

Figure 8.4-4: Procedure CAMEL_CF_MSC_ANSWER

8.5 Handling of mobile calls in the gsmSSF

8.5.1 State Idle

The following actions are possible in the state Idle (shown in sheet 1):

8.5.1.1 Int_Invoke_gsmSSF

DP_Collected_Info or DP_Terminating_Attempt_Authorised is armed as an TDP, depending if T-CSI or O-CSI is received in Int_Invoke_gsmSSF. The gsmSSF returns a confirmation to the GMSC/MSC and waits in Wait_For_Request.

8.5.1.2 Int_DP_O/T_Answer or Int_DP_O/T_Disconnect

An Int_Continue is sent to the GMSC/MSC and the process gsmSSF returns to idle. This may occur when previous relationship with the gsmSCF has been terminated.

8.5.1.3 Int_O/T_Exception

The process gsmSSF returns directly to idle. This may occur when previous relationship with the gsmSCF has been terminated.

8.5.2 State Wait_For_Request

8.5.2.1 Int_DP_Collected_Info

The gsmSSF opens a control relationship with the gsmSCF by sending CAP_InitialDP. The gsmSSF waits in state Waiting_For_Instructions.

8.5.2.2 DP_Terminating_Attempt_Authorised

See subclause 8.5.2.1.

8.5.2.3 Int_O/T_Exception

The process gsmSSF returns directly to idle.

8.5.3 Waiting_For_Instructions

8.5.3.1 CAP_Request_Report_BCSM_Event

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

The gsmSCF may request monitor for answer or/and disconnect of a party in the call. O/T_Answer may only be armed as EDP-N. O/T_Disconnect may be armed as an EDP-N or an EDP-R.

8.5.3.2 CAP_Continue

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

If DP_Disconnect is armed as an EDP-R the relationship with gsmSCF remains a control relationship and gsmSSF waits in state Monitoring., if DP Answer or DP Disconnect is armed as EDP-N the relationship is changed to a monitor relationship and gsmSSF waits in state Monitoring.

If no remaining EDPs are armed, the control relationship between gsmSSF and the gsmSCF is terminated. The process gsmSSF returns to idle.

8.5.3.3 CAP_Connect

If the current DP is DP2 or DP12 an Int_Connect is sent to request the GMSC/MSC to continue the call setup with modified information.

If DP_Disconnect is armed as an EDP-R the relationship with gsmSCF remains a control relationship and gsmSSF waits in state Monitoring., if DP Answer or DP Disconnect is armed as EDP-N the relationship is changed to a monitor relationship and gsmSSF waits in state Monitoring.

If no remaining EDPs are armed, the control relationship between gsmSSF and the gsmSCF is terminated. The process gsmSSF returns to idle.

If the current DP is not DP2 or DP12 an error is sent to the gsmSCF and the gsmSSF returns to the state Waiting_For_Instructions.

8.5.3.4 CAP_Release_Call

If CAP_Release_Call is received in the state Wait_For_Instructions, an Int_Release_Call is sent to the GMSC/MSC to release the call.

8.5.3.5 Timer expire

If the gsmSSF timer expires the transaction to the gsmSSF is aborted and an Int_Error is sent to the GMSC/MSC.

8.5.3.6 Int_O/T_Exception

If the gsmSSF receives an Int_Exception from the GMSC/MSC, its terminates the control relationship, sends Int_Continue to GMSC/MSC and returns to idle.

8.5.3.7 Int_DP_O/T_Disconnect

If the DP is armed for the leg indicated in Int_O/T_DP_Disconnect, a CAP_Event_Report_BCSM is sent to the gsmSCF and gsmSSF returns to state Waiting_For_Instructions.

8.5.4 Monitoring

8.5.4.1 Int_DP_O/T-Answer

If Int_DP_O/T_Answer is received, then the gsmSSF if the EDP-N is armed sends CAP_Event_Report_BCSM (Notify and Continue).

If no other EDP is armed, the relationship with the gsmSCF is terminated and the process returns to idle.

If armed EDPs still exist, the process returns to Monitoring.

8.5.4.2 Int_DP_O/T_Disconnect

If Int_DP_O/T_Disconnect is received and no EDP is armed for this DP then an Int_Continue is sent to the GMSC/MSC.

If Int_DP_O/T_Disconnect is received and this DP is armed as EDP-N for the leg indicated in Int_DP_Disconnect, then the CAP_Event_Report_BCSM (notify and continue) is sent to the gsmSCF and an Int_Continue is sent to the GMSC/MSC.

If no other EDP is armed, the relationship with the gsmSCF is terminated and the process returns to idle.

If armed EDPs still exist, the process returns to Monitoring.

If Int_DP_O/T Disconnect is received and this DP is armed as EDP-R for the leg indicated in Int_DP_Disconnect, then the CAP_Event_Report_BCSM (interrupted) is sent to the gsmSCF and the gsmSSF waits in state Waiting_For_Instructions.

8.5.4.3 CAP_Release_Call

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.

8.5.4.4 Int_O/T_Exception

If the gsmSSF receives an Exception event from the GMSC/MSC, it terminates the relationship (monitoring or control) with the gsmSCF and returns to idle.

8.5.5 Actions of the process gsmSSF in error cases

The detailed error handling for the process gsmSSF is specified in GSM 09.78.

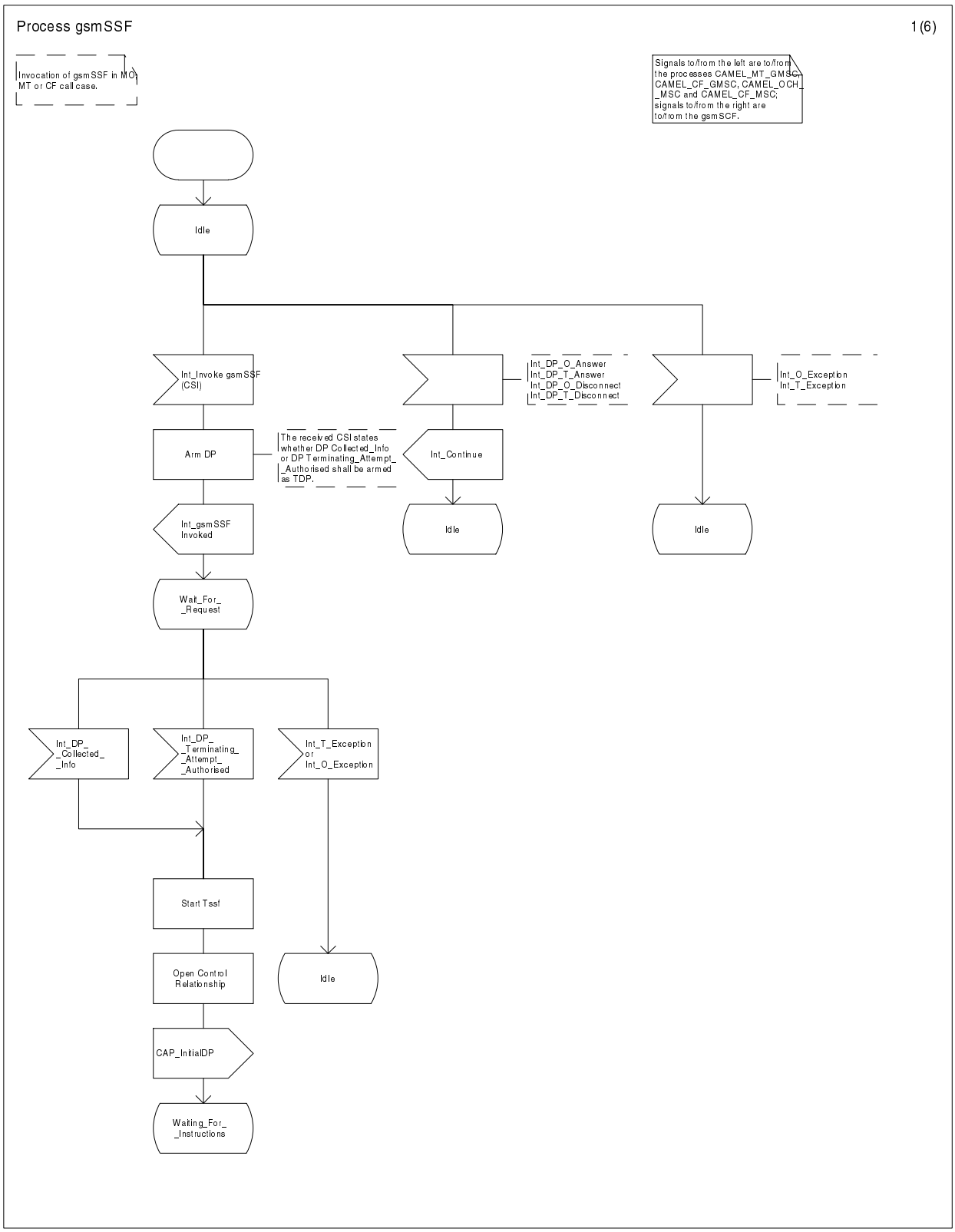

Figure 8.5-1 gsmSSF (sheet 1 of 6)

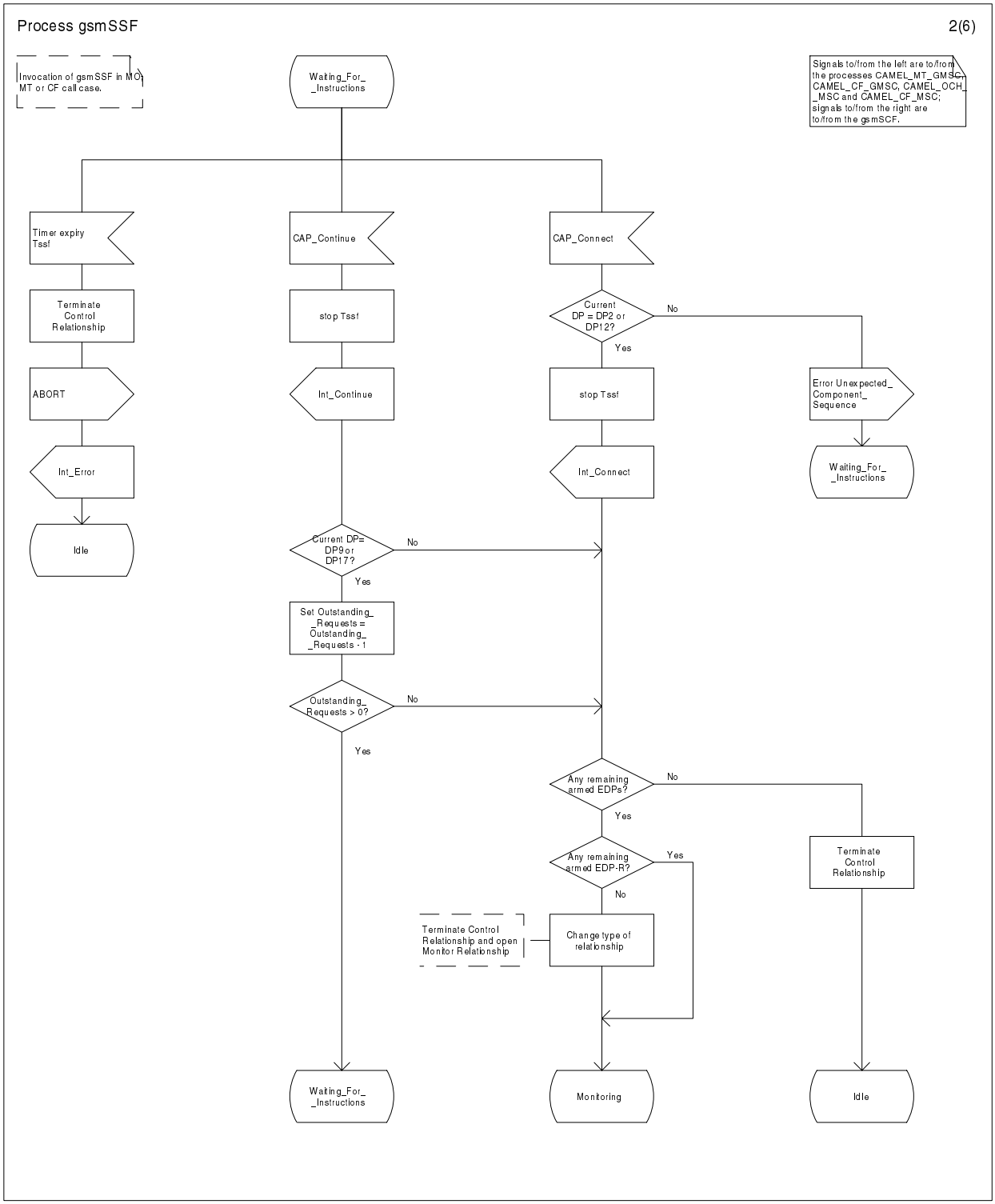

Figure 8.5-2 gsmSSF (sheet 2 of 6)

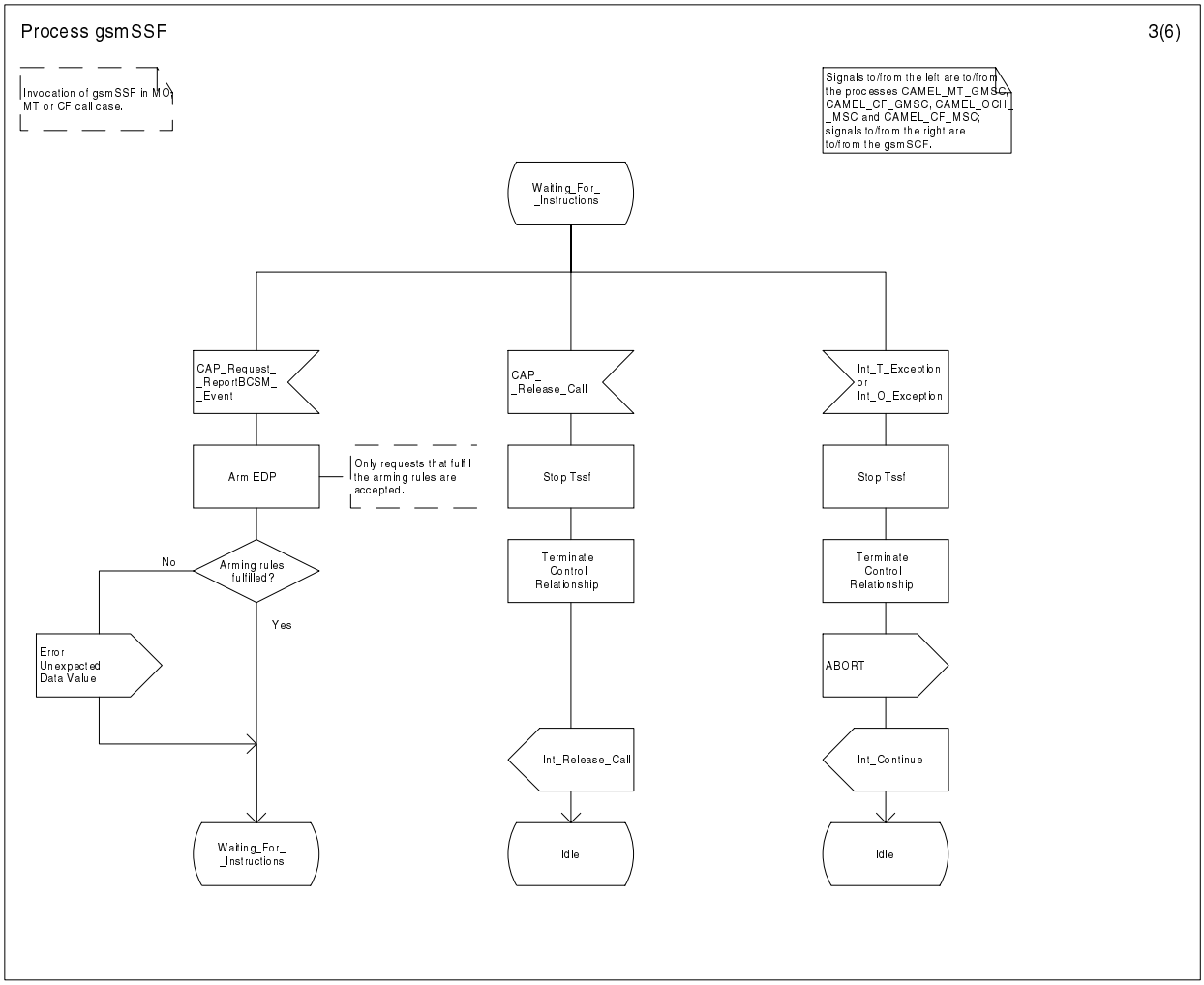

Figure 8.5-3 gsmSSF (sheet 3 of 6)

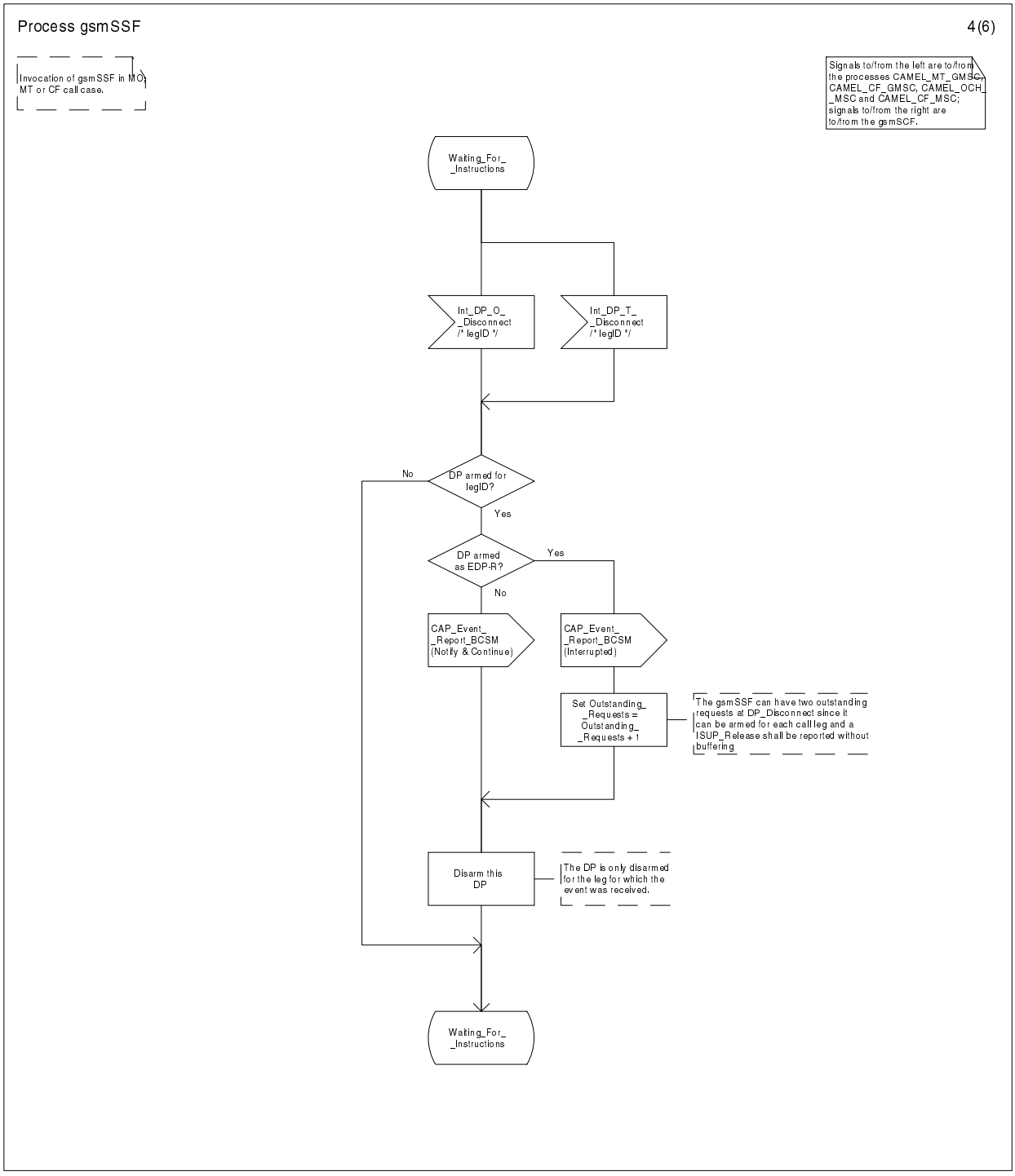

Figure 8.5-4 gsmSSF (sheet 4 of 6)

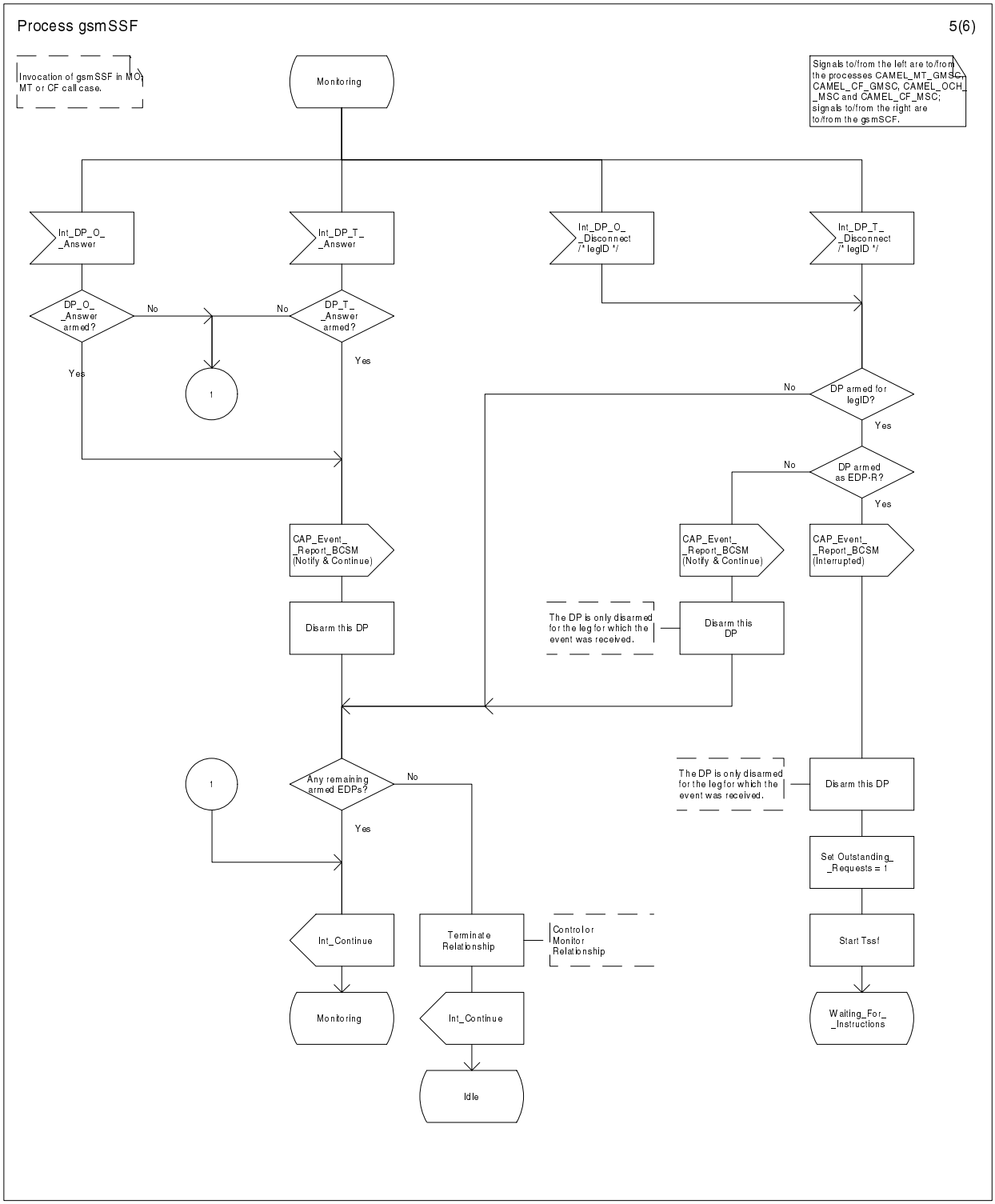

Figure 8.5-5 gsmSSF (sheet 5 of 6)

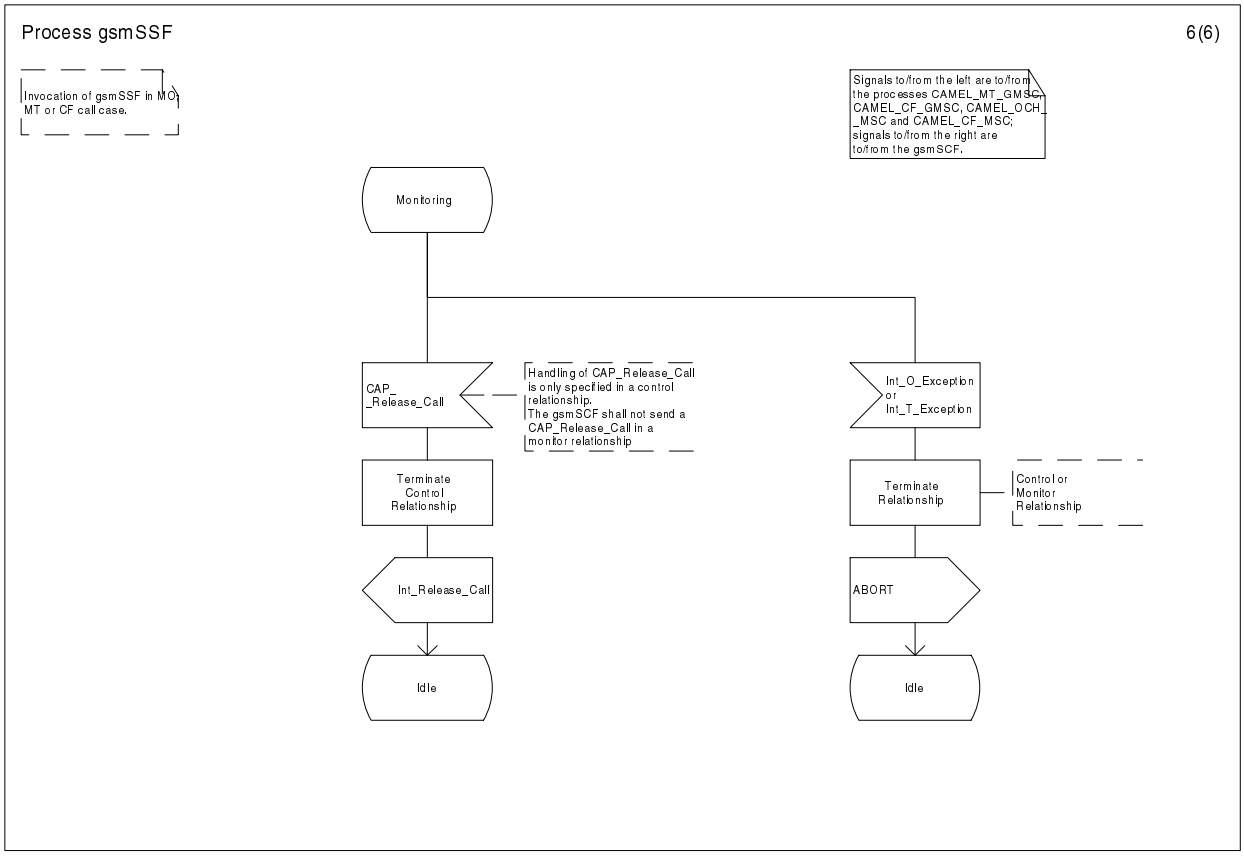

Figure 8.5-6 gsmSSF (sheet 6 of 6)

8.6 Any Time Interrogation

If a CAMEL based service needs the Subscriber State and/or the Location Information for the served subscriber, the gsmSCF initiates a transaction with the HLR by sending an Any Time Interrogation Request. Support for this procedure is a network operator option.

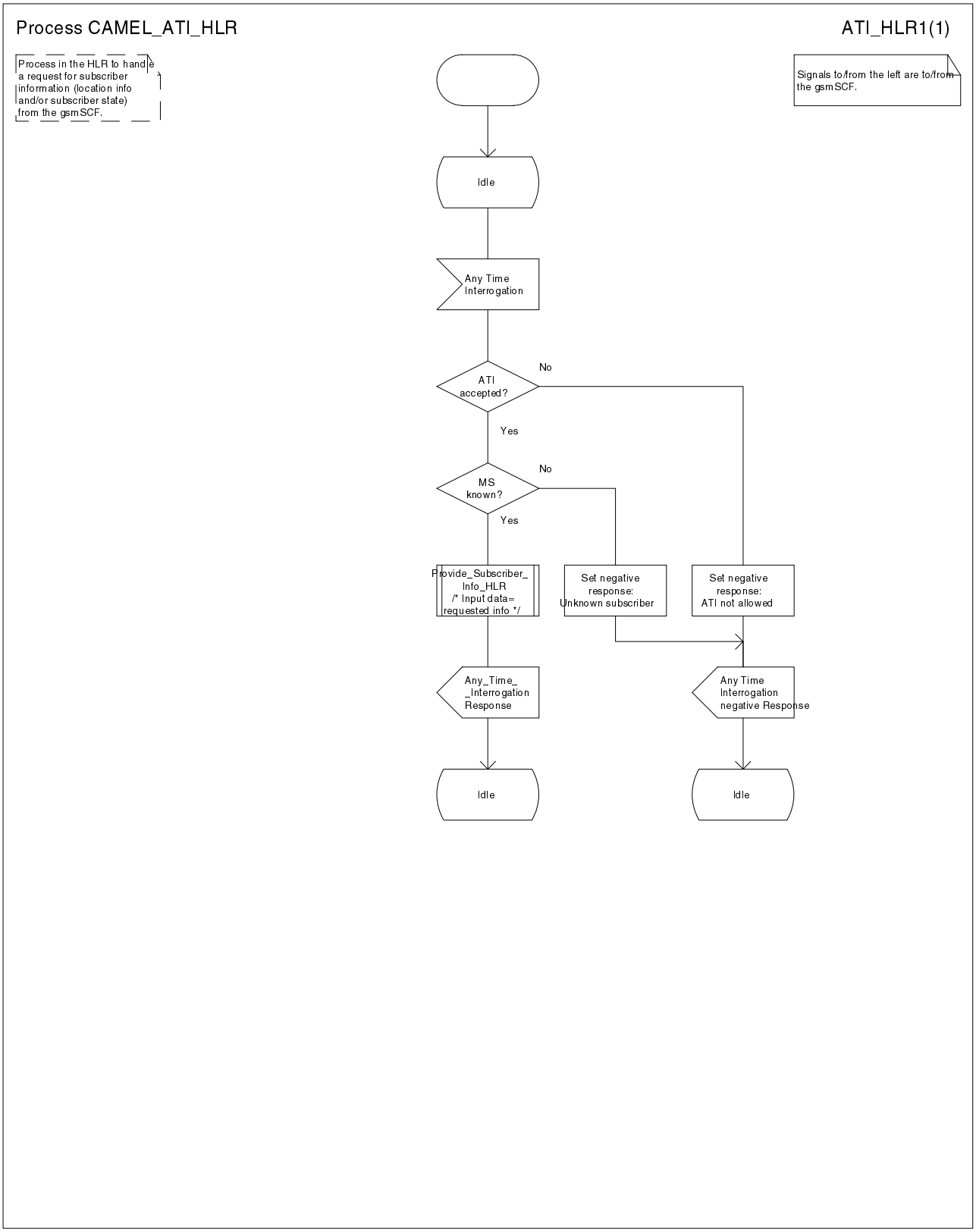

Figure 8.6-1 Process CAMEL_ATI_HLR

8.7 Procedure Provide_Subscriber_Info_HLR

The MS is not reachable if any of the following conditions is satisfied:

- The HLR has no location information for the subscriber (the HLR returns a not reachable reason of Not registered);
- The subscriber record is marked as MS purged (the HLR returns a not reachable reason of MS purged);
- The subscriber record is marked as MSC area restricted (the HLR returns a not reachable reason of Restricted area);
- The subscriber record is marked as Roaming Restricted due to Unsupported Feature (the HLR returns a not reachable reason of Restricted area);
- The subscriber is marked as deregistered because of subscription restrictions on roaming (the HLR returns a not reachable reason of Not registered).

If the VLR returns a Provide_Subscriber_Info Response, the HLR uses the information in the response 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 GSM 03.18 [3].

If the HLR has only the VLR number available as location information, the HLR may as a network option derive the location number and/or Geographical Info from the VLR number.

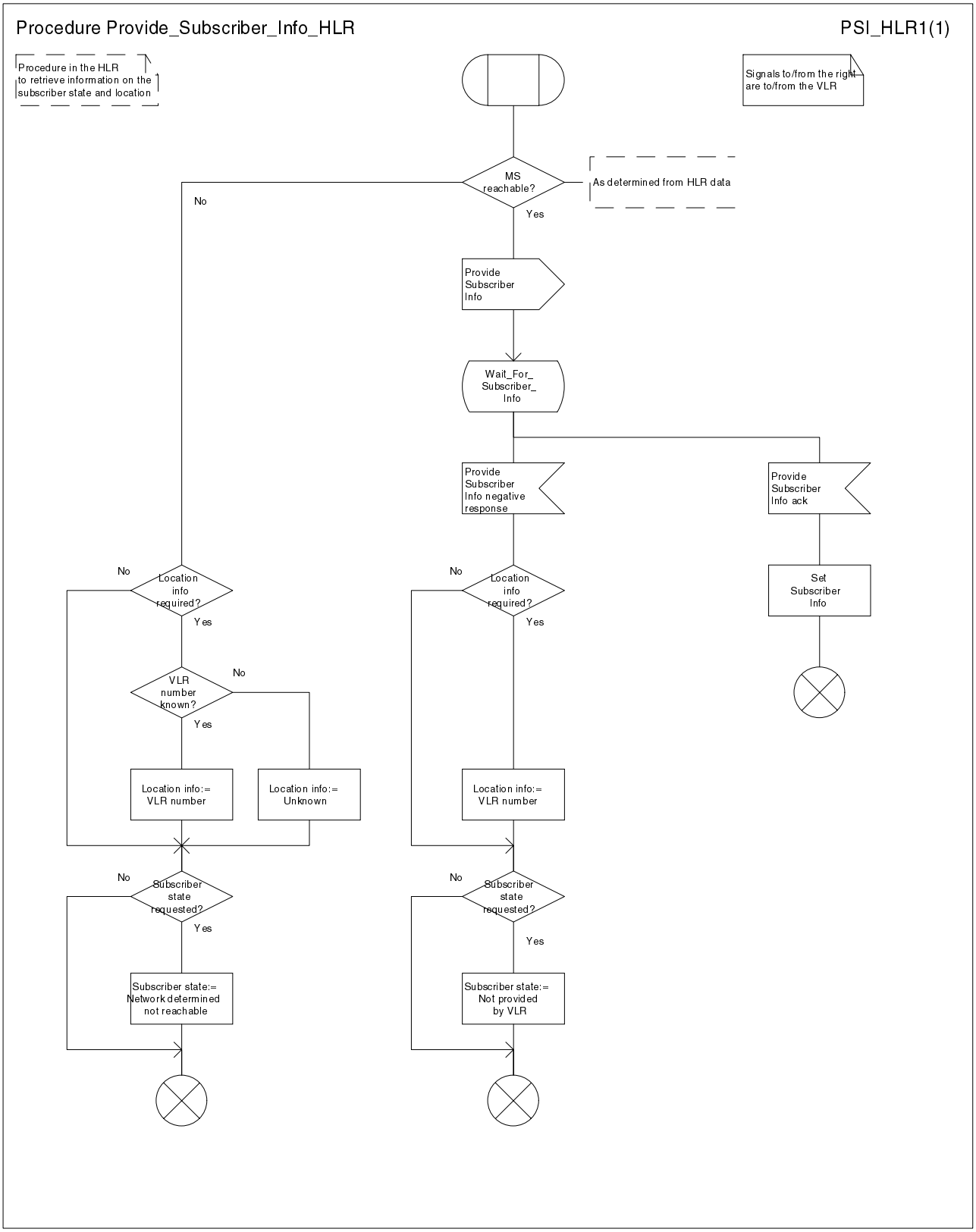

Figure 8.6-2 Procedure Provide_Subscriber_Info_HLR

8.8 CAMEL specific handling at subscriber data management in the HLR

If the VLR does not support CAMEL phase 1 the HLR may apply ODB, Roaming Restriction Due to Unsupported Feature, allow the call to continue without CAMEL or take network specific actions. The handling is subscriber specific.

8.9 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.

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 classifications to be used for the ASN.1 syntax of the protocol.

9.1 gsmSSF to gsmSCF information flows

9.1.1 Activity Test Response

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 Event Report BCSM

9.1.2.1 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.

9.1.2.2 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 i.e., O-Answer, T-Answer, O-Disconnect or T-Disconnect.
Event specific information BCSM	C	C	C	This IE indicates the call related information specific to the event. It will contain the "release Cause" for O- or T-Disconnect, if available. For O- and T-Answer it is not required.
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, i.e., Request or Notification.

M Mandatory (The IE shall always be sent)

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

- Not applicable

9.1.3 Initial DP

9.1.3.1 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.

9.1.3.2 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.
Basic Service Code	C	C	C	This IE indicates the type of basic service i.e., teleservice or bearer service.
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. For the MO case this IE is not used.
Called Party BCD Number	M	-	-	This IE contains the number used to identify the called party in the forward direction. It is used only for the MO case. It may also include service selection information, including ∗ and # digits.
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).
Call Reference Number	M	M	M	This IE may be used by the gsmSCF for inclusion in a network optional gsmSCF call record. For MO calls, the call reference number is set by the MSC and included in the MO call record. For MT calls, the call reference number is set by the GMSC and included on the RCF call record in the GMSC and on the MT call record in the terminating MSC. For CF calls, the call reference number is set by the GMSC and included on the CF record in the GMSC or the MSC.
Event Type BCSM	M	M	M	This IE indicates the armed BCSM DP event (i.e., Collected_Info and Term._Attempt_Authorised), resulting in the Initial DP IF.
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.

(continued)

The following information elements are required (concluded):

Information element name	MO	MF	MT	Description
Location Information	M	-	C	See GSM 03.18 [3].
Location Number	M	C	C	For mobile originated calls this IE represents the location of the calling party. In this case the location number may be derived from the cell id or location area of the calling party. The mapping from cell ID and location area to location number is network-specific and outside the scope of the GSM standard. For forwarded calls and mobile terminated calls this IE contains the location number received in incoming ISUP signalling.
MSC Address	M	M	M	E.164 address of interrogating MSC in international format. This IE may be used together with the Call Reference Number by the gsmSCF for inclusion in a network optional gsmSCF call record. For MO calls, the MSC Address is set by the MSC and included in the MO call record. For MT calls, the MSC Address is set by the GMSC and included on the RCF call record in the GMSC and on the MT call record in the terminating MSC. For CF calls, the MSC Address is set by the GMSC and included on the CF record in the GMSC or the MSC. Service designers should note that different implementers have interpreted in different ways the definition of the address to be used to populate this parameter for the CF case. The MSC address can therefore be regarded as reliable information for the CF case only when the specific implementation of the gsmSSF (and therefore the address used to populate this parameter) is known.
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 unambiguously the requested CAMEL service. 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". - NotProvidedFromVLR: The VLR did not provide any information on subscriber state even though it was requested.

Location Information contains the following information:

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

M Mandatory (The IE shall always be sent)

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

- Not applicable

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 Connect

9.2.2.1 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.

9.2.2.2 Information Elements

The following information elements are required:

Information element name	MO	MF	MT		Description
Calling Partys Category	O	O	O		This IE indicates the type of calling party (e.g., operator, pay phone, ordinary subscriber).
Destination Routing Address	O	O	O		This IE contains the called party number towards which the call is to be routed.
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.
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.
O-CSI Applicable	-	-	O	-	This IE indicates that the O-CSI, if present should be applied on the outgoing leg.

M Mandatory (The IE shall always be sent)

O Optional (Service logic dependent)

- Not applicable

9.2.3 Continue

9.2.3.1 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.

9.2.3.2 Information Elements

This IF contains no information elements.

9.2.4 Release Call

9.2.4.1 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.

9.2.4.2 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 gsmSSF 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)

9.2.5 Request Report BCSM Event

9.2.5.1 Description

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

9.2.5.2 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.

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 (i.e., O_Answer, T_Answer, O_Disconnect or T_Disconnect).
Leg ID	C	C	C	This parameter indicates the party in the call for which the event shall be reported. If not included, default is the party created with Connect IF for the events O_Answer and T_Answer. The Leg ID IE shall always be included for the events O-Disconnect and T-Disconnect.
Monitor Mode	M	M	M	This IE indicates how the event should be reported i.e., as request or notification.

M Mandatory (The IE shall always be sent)

C Conditional

9.3 gsmSCF to HLR information flows

9.3.1 Any Time Interrogation Request

9.3.1.1 Description

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

9.3.1.2 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)

9.4 HLR to gsmSCF information flows

9.4.1 Any Time Interrogation Response

9.4.1.1 Description

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

9.4.1.2 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 GSM 03.18 [3].
CellIdOrLAI	C	See GSM 03.18 [3].
Geographical Information	C	See GSM 03.18 [3].
Age Of Location Information	C	See GSM 03.18 [3].
VLR number	C	See GSM 03.18 [3].

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

9.5 HLR to VLR information flows

9.5.1 Delete Subscriber Data

9.5.1.1 Description

This IF is specified in GSM 09.02 [5] and is used by the HLR to delete subscriber data in the VLR.

9.5.1.2 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)

9.5.2 Insert Subscriber Data

9.5.2.1 Description

This IF is specified in GSM 09.02 [5] and is used by the HLR to insert subscriber data in the VLR.

9.5.2.2 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. It contains the gsmSCFAddress, ServiceKey, DefaultCallHandling and TdpList.

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

9.5.3 Provide Roaming Number

9.5.3.1 Description

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

9.5.3.4 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	C	This IE is used for correlation of call records outputted from the GMSC and the terminating MSC, and a network optional call record from the gsmSCF.
GMSC address	C	This IE is the E.164 address of the GMSC.

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

9.5.4 Provide Subscriber Info

9.5.4.1 Description

This IF is specified in GSM 03.18 [3] and is used by the HLR to request information (subscriber state and location) from the VLR at any time.

9.5.4.2 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 requested. - 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)

9.6 VLR to HLR information flows

9.6.1 Insert Subscriber Data ack

9.6.1.1 Description

This IF is specified in GSM 09.02 [5] and is used by the VLR to indicate to the HLR the result of the Insert Subscriber Data IF.

9.6.1.2 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. Only CAMEL phase 1 is used..

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

9.6.2 Provide Subscriber Info ack

9.6.2.1 Description

This IF is specified in GSM 03.18 [3] and is used by the VLR to provide the requested information to the HLR.

9.6.2.2 Information Elements

Provide Subscriber Info Response 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 the Location Information are specified in GSM 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)

9.7 HLR to GMSC information flows

9.7.1 Send Routeing Info ack

9.7.1.1 Description

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

9.7.1.2 Information Elements

Send Routeing Info ack contains the following CAMEL specific IE:

Information element name	Required	Description
Location Information	C2	This IE indicates the location of the served subscriber.
O-CSI	C	This IE identifies the subscriber as having originating CAMEL services. It contains the gsmSCFAddress, ServiceKey, DefaultCallHandling andTdpList. 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	C2	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. It contains the gsmSCFAddress, ServiceKey, DefaultCallHandling andTdpList. 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.

Location Information contains the following information:

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

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

C2 Conditional (The IE shall be sent, if available and indicated by Subscriber Information in Send Routeing Information Ack indicator.)

9.8 GMSC to HLR information flows

9.8.1 Send Routeing Info

9.8.1.1 Description

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

9.8.1.2 Information Elements

Send Routeing Info contains the following CAMEL specific IE:

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 omitted from the first interrogation; shall be sent in the second 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 be omitted from the first interrogation; shall be sent in the second interrogation.
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 second 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	C	This IE is used for correlation of call records output from the GMSC and the terminating MSC, and a network optional call record from the gsmSCF. For CAMEL this parameter shall be included in the second interrogation. For other services it may be needed in the first interrogation.
GMSC address	C	This IE is the E.164 address of the GMSC. Shall be sent in the second interrogation.

C Conditional; (The condition for the inclusion of IE is shown in the Description column)

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

9.9 VMSC to GMSC information flows

9.9.1 Resume Call Handling

9.9.1.1 Description

This IF is described in GSM 03.79 [4] and is used to request the GMSC to take over handling the call so that it can be forwarded from the GMSC.

9.9.1.2 Information Elements

Resume Call Handling 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.

C Conditional; the condition for the presence of this IE is shown in the Description column

9.10 MSC to VLR information flows

9.10.1 Send Info For Outgoing Call

9.10.1.1 Description

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

9.10.1.2 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 condition for the presence of this IE is shown in the Description column

9.11 VLR to MSC information flows

9.11.1 Complete Call

9.11.1.1 Description

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

9.11.1.2 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.

C Conditional; the condition for the presence of this IE is shown in the Description column

9.11.2 Send Info For Incoming Call ack

9.11.2.1 Description

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

9.11.2.2 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. As an implementation option, may be sent if it was received in the Provide Roaming Number for this call.

C Conditional; the condition for the presence of this IE is shown in the Description column

9.11.3 Send Info For Incoming Call negative response

9.11.3.1 Description

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

9.11.3.2 Information Elements

Send Info For Incoming Call negative response contains the following CAMEL specific IE which may be attached as a parameter to any of the negative response values defined in GSM 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 condition for the presence of this IE is shown in the Description column

Annex A (informative): Document Change History

SPEC	SMG#	CR	PHASE	VERS	NEW_VERS	SUBJECT
03.78	s21	NEW	2+	2.0.0	5.0.0	CAMEL phase 1 (stage 2)
03.78	s22	A001	2+	5.0.0	5.1.0	CallingPartyNumber in Connect
03.78	s22	A002	2+	5.0.0	5.1.0	MSC Id for Call Reference Number
03.78	s22	A004	2+	5.0.0	5.1.0	Introduction of value 'not Provided from VLR'' in subscriber state
03.78	s22	A005	2+	5.0.0	5.1.0	Setting of Location Number
03.78	s22	A006	2+	5.0.0	5.1.0	Clarification on handling of Connect and Continue operations
03.78	s22	A007	2+	5.0.0	5.1.0	Change to CAMEL phase 1 regarding * and # in Called Party Number
03.78	s23	A003	R96	5.1.0	5.2.0	Alignment with stage 3 specifications (09.78 and 09.02) and clarifications
03.78	s23	A010	R96	5.1.0	5.2.0	Alignment subscriber status in CAMEL with MAP
03.78	s24	A008	R97	5.2.0	6.0.0	Support of CAMEL phase 2 (stage2)
03.78	s24	A009	R96	5.2.0	5.3.0	Concentration of description of core call handling functions in 03.18, Changes to ease the documentation of new services
03.78	s24	A011	R96	5.2.0	5.3.0	Removal of CallingPartyNumber from Connect
03.78	s24	A013	R96	5.2.0	5.3.0	Removal of the CalledPartyNumber for MO calls from IDP
03.78	s24	A014	R96	5.2.0	5.3.0	Use of the CallReference Number & GMSC address in SRI
03.78	s25	A008	R97	5.3.1	6.0.0	CAMEL phase 2
03.78	s25	A015	R96	5.3.1	5.4.0	Redundant definition of Location Information elements
03.78	s25	A016	R96	5.3.1	5.4.0	Corrections to CAMEL relationship description
03.78	s25	A017	R96	5.3.1	5.4.0	Correction to CAMEL phase 1 for forwarded calls
03.78	s26	A020	R96	5.4.0	5.5.0	Error handling in GSM 03.78 paragraph 8.6
03.78	s26	A022	R96	5.4.0	5.5.0	Release by A party for forwarded calls and CAMEL
03.78	s26	A023	R96	5.4.0	5.5.0	Progress is to be sent on CONNECT reception
03.78	s27	A033	R96	5.5.0	5.6.0	Corrections (corresponds to A029)
03.78	s28	A047	R96	5.6.0	5.7.0	Clarification of handling of call forwarding
03.78	s29	A107	R96	5.7.0	5.8.0	Health warning on MSC Address in InitialDP

History

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