

3GPP2 X.S0030-0

Version 1.0

Date: September 2005



3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"

MAP Enhancements to Support Enhanced Message Waiting Notification (MWN)

COPYRIGHT

3GPP2 and its Organizational Partners claim copyright in this document and individual Organizational Partners may copyright and issue documents or standards publications in individual Organizational Partner's name based on this document. Requests for reproduction of this document should be directed to the 3GPP2 Secretariat at secretariat@3gpp2.org. Requests to reproduce individual Organizational Partner's documents should be directed to that Organizational Partner. See www.3gpp2.org for more information.

Revision History

Revision		Date
Rev. 1	Initial Publication	September 2005

MAP Enhancements to Support
Enhanced Message Waiting Notification (MWN)

CONTENTS

1		
2		
3		
4		
5		
6		
7		
8		
9	List of Figures	iii
10		
11	List of Tables	iv
12		
13	Foreword	v
14		
15	Introduction	1
16	1 Objective.....	1
17	2 Scope	1
18	3 References	1
19	4 Editorial Conventions	1
20		
21		
22	Part 000 - Introduction to TIA-41	2
23	4 Symbols and Abbreviations.....	2
24		
25	Automatic Roaming Information Flows	3
26	6.13 Message Waiting Count Notification	3
27	6.13.T Successful Message Waiting Count Notification	3
28	6.13.U Message Waiting Count Notification: Initial MS Registration	5
29	6.13.V No Message Waiting Count Notification: Initial MS Registration	7
30	6.13.W No Message Waiting Count Notification	9
31	6.13.X Successful MSInactive: MS Declared Inactive	11
32	6.13.Y Successful MSInactive: MS Deregistered	12
33		
34	MAP Operations Signaling Protocol	13
35	2 Operation Definitions	13
36	2.39 MSInactive	13
37	2.49 RegistrationCancellation	15
38		
39	MAP Parameters Signaling Protocol	16
40	1 General	16
41	1.2 Parameter Identifiers	16
42	2 Parameter Definitions	17
43	2.182 Profile	17
44	2.xxx MessageWaitingCountAcknowledged	18
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		

Signaling Procedures.....	19	1
3.1 Registration Call Tasks	19	2
3.1.3 Loading of Profile Parameters	19	3
		4
		5
4.30 MS Inactive	22	6
4.30.1 MSC Initiating an MS Inactive	22	7
4.30.2 VLR Receiving MSInactive INVOKE	23	8
4.30.3 VLR Detection of MS Inactivity.....	23	9
4.30.4 HLR Receiving MSInactive INVOKE	24	10
		11
		12
		13
4.37 Registration Cancellation	26	14
4.37.1 HLR Initiating Registration Cancellation	26	15
4.37.4 MSC Receiving RegistrationCancellation INVOKE.....	27	16
		17
		18
4.38 Registration Notification	30	19
4.38.1 MSC Initiating MS Registration	30	20
4.38.2 VLR Receiving RegistrationNotification INVOKE	32	21
4.38.3 HLR Receiving RegistrationNotification INVOKE	37	22
		23
		24
5.13 Message Waiting Notification (MWN).....	41	25
5.13.6 HLR MWN Status Change Invocation	41	26
5.13.9 MSC MWN Status Change Invocation	41	27
		28
		29
		30
		31
		32
		33
		34
		35
		36
		37
		38
		39
		40
		41
		42
		43
		44
		45
		46
		47
		48
		49
		50
		51
		52
		53
		54
		55
		56
		57
		58
		59
		60

LIST OF FIGURES

Automatic Roaming Information Flows

Figure 1	Successful Message Waiting Count Notification	3
Figure 2	Message Waiting Count Notification: Initial MS Registration.....	5
Figure 3	No Message Waiting Count Notification: Initial MS Registration.....	7
Figure 4	No Message Waiting Count Notification: Initial MS Registration.....	9
Figure 5	Successful MSInactive: MS Declared Inactive.....	11
Figure 6	Successful MSInactive: MS Declared Inactive.....	12

LIST OF TABLES

Part 000 - Introduction to TIA-41

Table 2 Symbols and Abbreviations 2

MAP Parameters Signaling Protocol

Table 1 MAP Parameter Identifiers 16

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

FOREWORD

(This foreword is not part of this Specification.)

This Specification describes the modifications and additions to X.S0004 for enhanced Message Waiting Notification (MWN) operation. The enhanced MWN operations can reduce the load on the forward control channel that is associated with updating the MS's Message Waiting Count.

This Specification is organized into the following sections:

- **Introduction.** This section describes the scope of this document and provides document references and editorial conventions.
- **Part 000 - Introduction to TIA-41.** This section describes the additions and modifications to X.S0004-000-E (Introduction to TIA-41) needed for enhanced Message Waiting Count Notification.
- **Automatic Roaming Information Flows.** This section provides automatic roaming information flows that illustrate enhanced Message Waiting Count Notification.
- **MAP Signaling Protocol.** This sections provides the additions and modifications to X.S0004-540-E (MAP Operations Signaling Protocol) and X.S0004-550-E (MAP Parameters Signaling Protocol) needed for enhanced Message Waiting Count Notification.
- **MAP Signaling Procedures.** This section provides the additions and modifications to N.S0005 (Signaling Procedures) for enhanced Message Waiting Count Notification.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

This page is intentionally left blank.

INTRODUCTION

1 Objective

The purpose of this document is to describe enhanced Message Waiting Notification (MWN) operation that reduces the load on the forward control (paging) channel associated with updating the MS's Message Waiting Count.

2 Scope

This document provides automatic roaming information flows that illustrate enhanced Message Waiting Count operation. This document also describes the signaling protocol and signaling procedure modifications needed for enhanced Message Waiting Count operation.

3 References

The following specifications and standards contain provisions which, through reference in this text, constitute provisions of this document. At the time of publication, the editions indicated were valid. All standards and specifications are subject to revision, and parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

- [1] **3GPP2**: N.S0005-0 Version 1.0, Cellular Radiotelecommunications Intersystem Operations; July 1997
- [2] **3GPP2**: X.S0004-000-E Version 1.0, Introduction to TIA-41; March 2004
- [3] **3GPP2**: X.S0004-540-E Version 1.0, MAP Operations Signaling Protocols; March 2004
- [4] **3GPP2**: X.S0004-550-E Version 1.0, MAP Parameters Signaling Protocols; March 2004
- [5] **3GPP2**: N.S0009-0 Version 1.0, IMSI; January 2002
- [6] **3GPP2**: N.S0016-0 Version 1.0, TIA/EIA-41-D Internationalization; August 1999

4 Editorial Conventions

The following editorial conventions are applicable for this document:

- underline: addition
- ~~cross-out~~: deletion
- change bar: indicates additions or deletions
- new sub-sections are identified in the sub-section heading
- for clarity, new sub-sections are shown with vertical change bars but are not underlined

PART 000 - INTRODUCTION TO TIA-41

The section describes the modifications to [2] needed for enhanced Message Waiting Count operation.

4 Symbols and Abbreviations

(see [2], page 000-28)

Table 2 Symbols and Abbreviations

Symbol or Abbreviation	Meaning
•••	•••
MWCACK	<u>MessageWaitingCountAcknowledged parameter</u>
•••	•••

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

AUTOMATIC ROAMING INFORMATION FLOWS

This section provides automatic roaming information flows that illustrate enhanced intersystem operations for message waiting count notification.

6.13 Message Waiting Count Notification

6.13.T Successful Message Waiting Count Notification

This scenario illustrates successful message waiting count notification. The Serving MSC stores information on the message waiting count acknowledged by the MS.

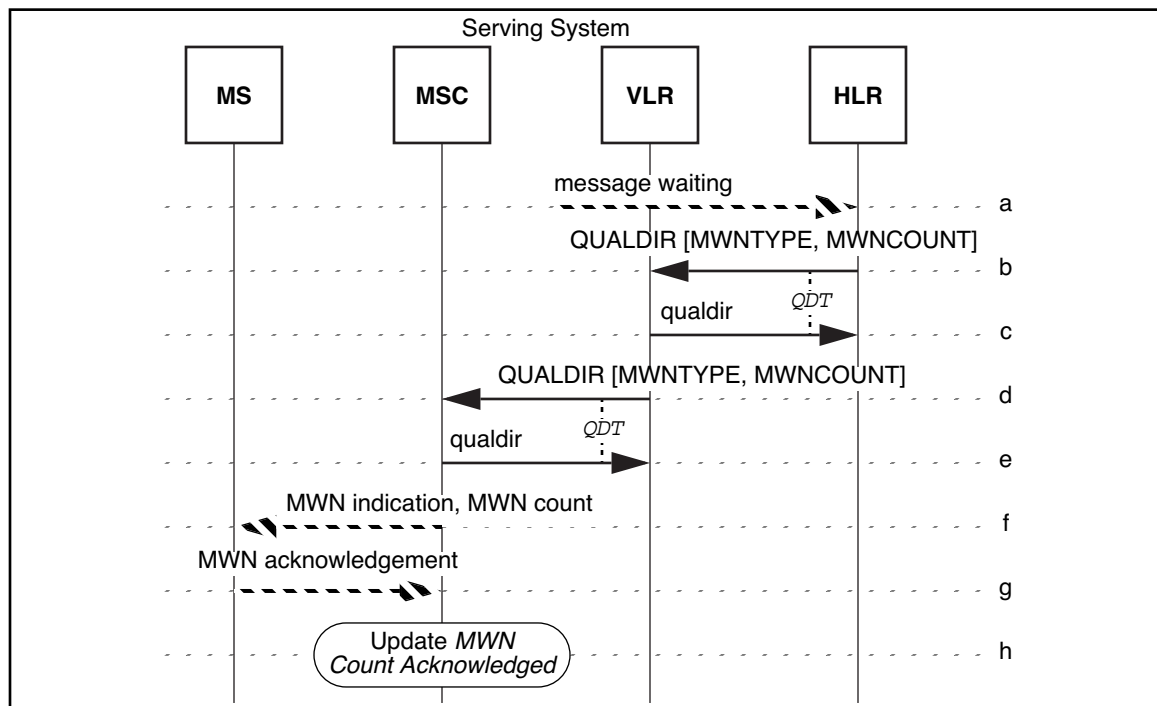


Figure 1 Successful Message Waiting Count Notification

- a. The HLR is notified that there is a message waiting for a served MS.
- b. The HLR reports the change in the MS's MWN status by sending a QUALDIR to the VLR where the MS is registered.

Parameters	Usage	Type
MWNTYPE	Indicates that notification via <i>Message Waiting Count Indication</i> is required.	R
MWNCOUNT	Indicates the type and number of messages waiting.	R

- c. The VLR sends a qualdir to the HLR.
- d. The VLR reports the change in the MS's MWN status by sending a QUALDIR to the Serving MSC. Additional parameters are as in Step-b.
- e. The Serving MSC sends a qualdir to the VLR.

- f. The Serving MSC compares the received MWNCOUNT and MWCACK parameter values. The parameter values are not equal and the Serving MSC notifies the served MS of the change in the MS's MWN status via the appropriate notification method (i.e., Message Waiting Indication and Count Indication).
- g. The MS acknowledges the notification.
- h. The MSC updates the *Message Waiting Count Acknowledged* for the MS.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

6.13.U Message Waiting Count Notification: Initial MS Registration

This scenario illustrates successful message waiting count notification when the MS roams to a new system. The Serving MSC stores information on the message waiting count acknowledged by the MS.

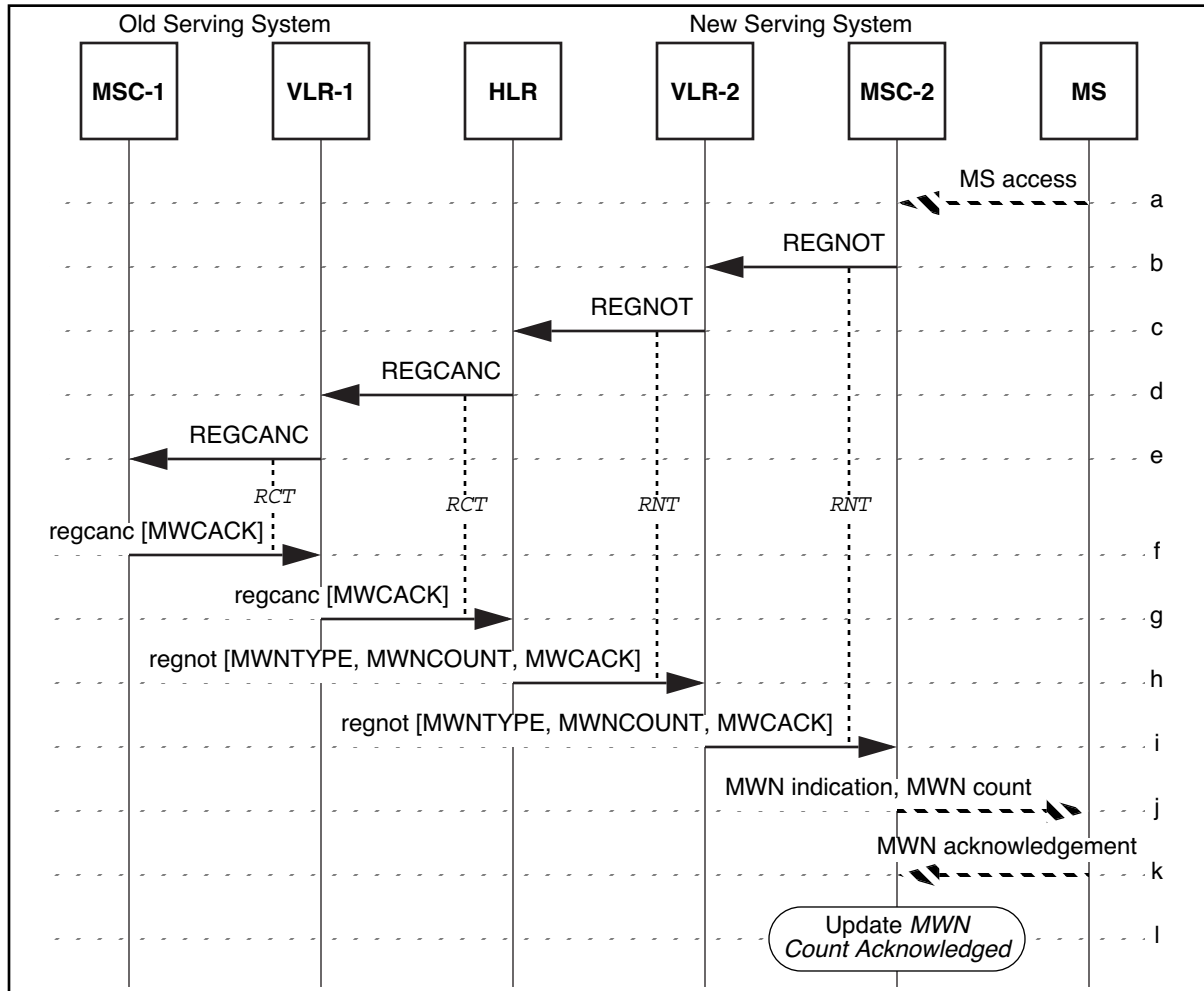


Figure 2 Message Waiting Count Notification: Initial MS Registration

- a. The MS accesses the new Serving MSC (MSC-2).
- b. After determining that a roaming MS is now within its service area, the new Serving MSC (MSC-2) sends a REGNOT to its VLR (VLR-2); MSC-2 may detect the MS's presence through autonomous registration, call origination, call termination (i.e., a page response following a call to the roamer port) or a service order.
- c. Since the MS is unknown to VLR-2, VLR-2 sends a REGNOT to the HLR associated with the MS. Note that the RegistrationNotification response from the VLR to the MSC is contingent upon the response received from the HLR.
- d. Since the MS was previously registered elsewhere, the HLR sends a REGCANC to the previously visited VLR (VLR-1).
- e. VLR-1 sends a REGCANC to the previously visited MSC (MSC-1).

- f. MSC-1 sends a *regcanc* to VLR-1 and includes the *MWCACK* parameter set to the *Message Waiting Count Acknowledged* value for the MS. MSC-1 removes all record of the MS from its memory.
- g. VLR-1 relays the *regcanc* to the HLR and removes all record of the MS from its memory.
- h. There are undelivered messages waiting for the MS and the subscriber is authorized for Message Waiting Count. The HLR sends a *regnot* to VLR-2. The HLR includes the *MWNTYPE*, *MWNCOUNT* and *MWCACK* parameters to report the status of the MS's MWN status.

Parameters	Usage	Type
MWNTYPE	Indicates that notification of Message Waiting Count Indication is required.	R
MWNCOUNT	Indicates the type and number of messages waiting.	R
MWCACK	Indicates the Messages Waiting Count that was last acknowledged by the MS.	R

- i. VLR-2 sends a *regnot* to the new Serving MSC.
- j. The Serving MSC compares the received *MWNCOUNT* and *MWCACK* parameter values. The parameter values are not equal and the Serving MSC notifies the served MS of the change in the MS's MWN status via the appropriate notification method (i.e., Message Waiting Indication and Count Indication).
- k. The MS acknowledges the notification.
- l. The MSC updates the *Message Waiting Count Acknowledged* for the MS.

6.13.V No Message Waiting Count Notification: Initial MS Registration

This scenario illustrates the Serving MSC determining that a newly registered MS has already acknowledged the current Message Waiting Count. The Serving MSC does not send a notification to the MS of the Message Waiting Count.

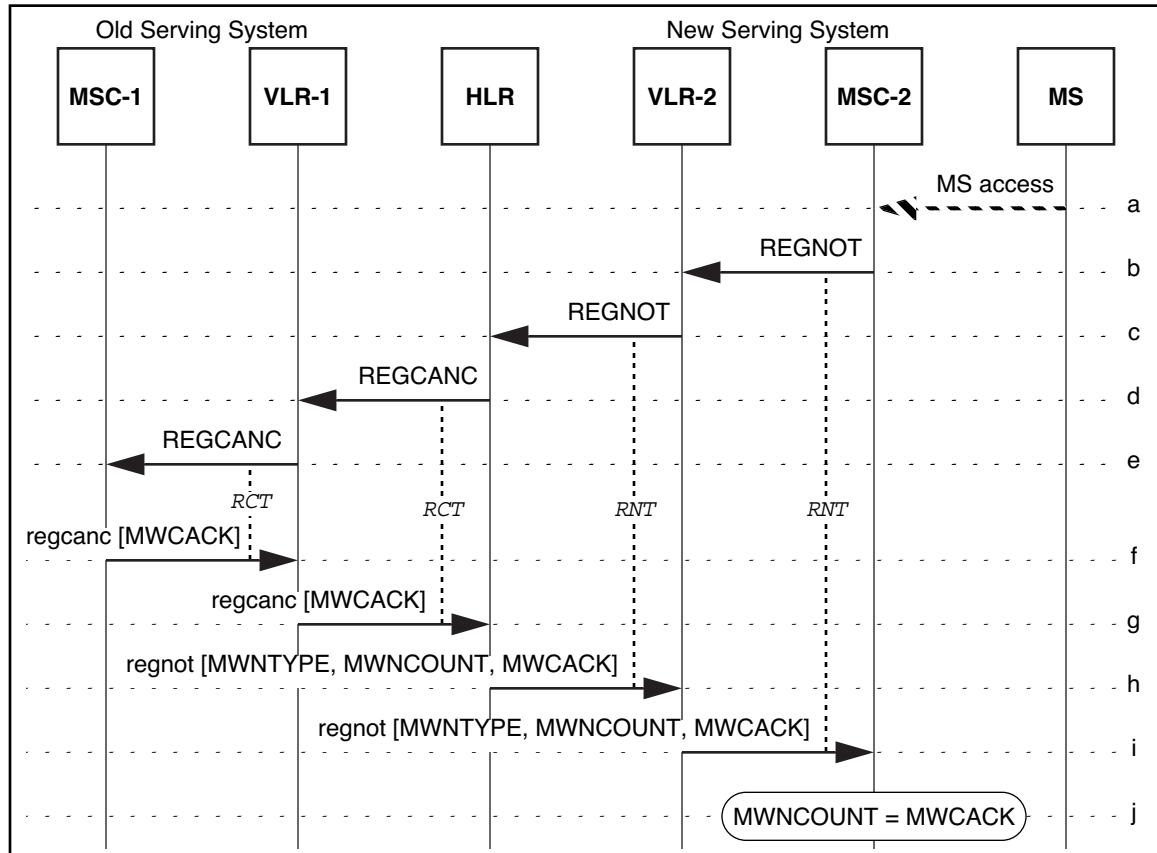


Figure 3 No Message Waiting Count Notification: Initial MS Registration

- The MS accesses the new Serving MSC (MSC-2).
- After determining that a roaming MS is now within its service area, the new Serving MSC (MSC-2) sends a REGNOT to its VLR (VLR-2); MSC-2 may detect the MS's presence through autonomous registration, call origination, call termination (i.e., a page response following a call to the roamer port) or a service order.
- Since the MS is unknown to VLR-2, VLR-2 sends a REGNOT to the HLR associated with the MS. Note that the RegistrationNotification response from the VLR to the MSC is contingent upon the response received from the HLR.
- Since the MS was previously registered elsewhere, the HLR sends a REGCANC to the previously visited VLR (VLR-1).
- VLR-1 sends a REGCANC to the previously visited MSC (MSC-1).
- MSC-1 sends a regcanc to VLR-1 and includes the MWCACK parameter set to the *Message Waiting Count Acknowledged* value for the MS. MSC-1 removes all record of the MS from its memory.
- VLR-1 relays the regcanc to the HLR and removes all record of the MS from its memory.

- h. There are undelivered messages waiting for the MS and the subscriber is authorized for Message Waiting Count. The HLR sends a `regnot` to VLR-2. The HLR includes the `MWNTYPE`, `MWNCOUNT` and `MWCACK` parameters to report the status of the MS's MWN status.

Parameters	Usage	Type
MWNTYPE	Indicates that notification of Message Waiting Count Indication is required.	R
MWNCOUNT	Indicates the type and number of messages waiting.	R
MWCACK	Indicates the Messages Waiting Count that was last acknowledged by the MS.	R

- i. VLR-2 sends a `regnot` to the new Serving MSC.
- j. The Serving MSC compares the received `MWNCOUNT` and `MWCACK` parameter values. The parameter values are equal. The Serving MSC does not notify the MS of the current Message Waiting Count.

6.13.W No Message Waiting Count Notification

This scenario illustrates initial MS registration. The new and old Serving MSCs are associated with the same VLR. The new Serving MSC determines that the MS has already acknowledged the current Message Waiting Count. The new Serving MSC does not send a notification to the MS of the Message Waiting Count.

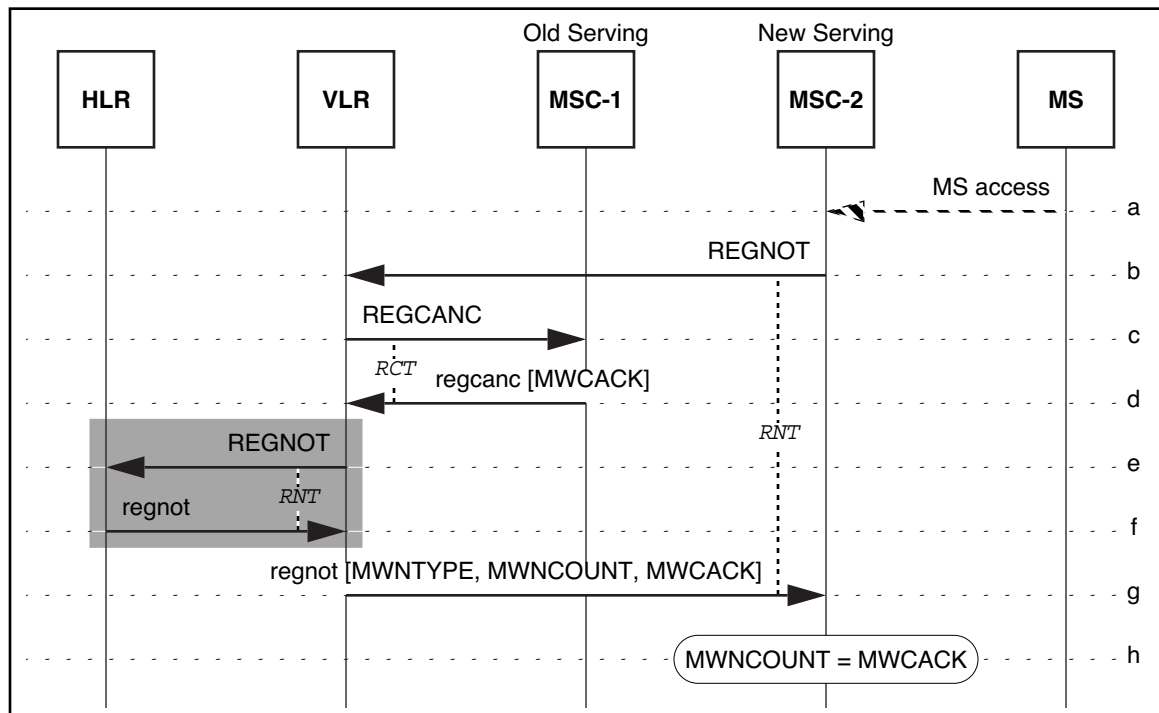


Figure 4 No Message Waiting Count Notification: Initial MS Registration

- a. The MS accesses the new Serving MSC (MSC-2).
- b. After determining that a roaming MS is now within its service area, the new Serving MSC (MSC-2) sends a REGNOT to its VLR (VLR-2); MSC-2 may detect the MS's presence through autonomous registration, call origination, call termination (i.e., a page response following a call to the roamer port) or a service order.
- c. Since the MS is known to the VLR, the VLR sends a REGCANC to the MSC (MSC-1) where the MS was previously registered.
- d. MSC-1 sends a regcanc to VLR-1 and includes the MWCACK parameter set to the *Message Waiting Count Acknowledged* value for the MS. MSC-1 removes all record of the MS from its memory.
- e. The VLR may send a REGNOT to the HLR associated with the MS to report the new Serving MSC identity to the HLR.
- f. The HLR sends a regnot to the VLR.
- g. The VLR sends a regnot to MSC-2 and includes the MWCACK received from MSC-1 at Step-d.

Parameters	Usage	Type
MWNTYPE	Indicates that notification of Message Waiting Count Indication is required.	R

Parameters	Usage	Type
MWNCOUNT	Indicates the type and number of messages waiting.	R
MWCACK	Indicates the Messages Waiting Count that was last acknowledged by the MS.	R

- h. The Serving MSC compares the received MWNCOUNT and MWCACK parameter values. The parameter values are equal. The Serving MSC does not notify the MS of the current Message Waiting Count.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

6.13.X Successful MSInactive: MS Declared Inactive

This scenario illustrates the use of the MSInactive operation to declare an MS inactive. The MS's *Message Waiting Count Acknowledged* is provided to the HLR.

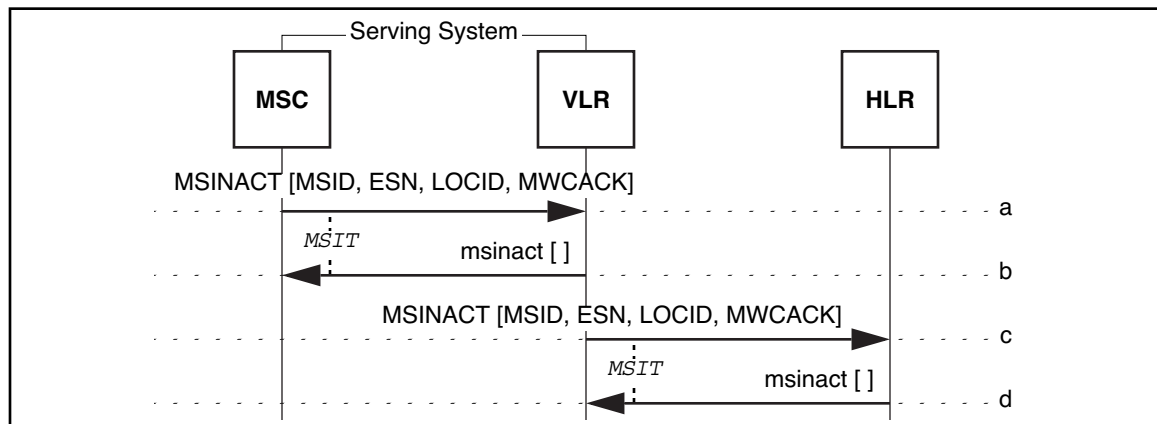


Figure 5 Successful MSInactive: MS Declared Inactive

- a. The Serving MSC determines that an MS is no longer active and reports the MS's inactivity by sending an MSINACT to the Serving VLR. The MWCACK parameter is set to the *Message Waiting Count Acknowledged* value for the MS.

Parameters	Usage	Type
MSID	Served MS MSID.	R
ESN	Served MS ESN.	R
LOCID	MS's LocationAreaID. Include if available.	O
MWCACK	Indicates the Messages Waiting Count that was last acknowledged by the MS.	R

- b. The Serving VLR sends an empty msinact to the Serving MSC.
- c. The Serving VLR reports the MS's inactivity by sending an MSINACT to the HLR. The VLR relays the parameters received from the Serving MSC.
- d. The HLR sends an empty msinact to the Serving VLR. The HLR stores the *Message Waiting Count Acknowledged* value for the MS.

6.13.Y Successful MSInactive: MS Deregistered

This scenario illustrates the use of the MSInactive operation to deregister an MS and convey the CallHistoryCount from the VLR, through the HLR to the AC. The MS's *Message Waiting Count Acknowledged* is provided to the HLR.

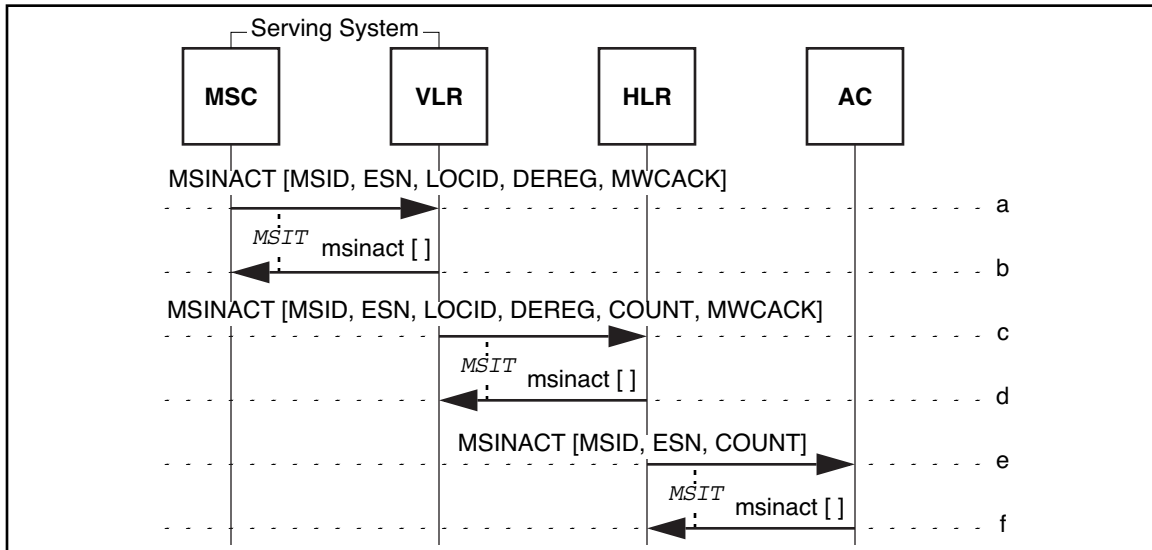


Figure 6 Successful MSInactive: MS Declared Inactive

- a. The Serving MSC determines that deregistration of a served MS is required. This may be due to receipt of an MS power-down indication, MS inactivity, or loss of radio contact. The Serving MSC sends an MSINACT, including a DeregistrationType parameter, to its VLR. The MWCACK parameter is set to the *Message Waiting Count Acknowledged* value for the MS. The MSC removes all record of the MS from its memory.

Parameters	Usage	Type
MSID	Served MS MSID.	R
ESN	Served MS ESN.	R
LOCID	MS's LocationAreaID. Include if available.	O
DEREG	Indication that MS is to be deregistered.	R
MWCACK	Indicates the Messages Waiting Count that was last acknowledged by the MS.	R

- b. The Serving VLR sends an empty msinact to the Serving MSC.
- c. The Serving VLR determines that deregistration of an MS is required. The VLR sends an MSINACT to the HLR and relays the parameters received from the Serving MSC. If SSD is shared, the VLR includes the COUNT parameter set to the MS's Call History Count value. The VLR removes all record of the MS from its memory.
- d. The HLR sends an empty msinact to the Serving VLR and stores the *Message Waiting Count Acknowledged* value for the MS. The HLR removes its pointer to the VLR.
- e. If SSD is shared and the COUNT parameter was received from the Serving VLR, the HLR sends an MSINACT to the AC.
- f. The AC sends an empty msinact to the HLR.

MAP OPERATIONS SIGNALING PROTOCOL

This section provides the additions and modifications to the MAP operations signaling protocol that are required for enhanced message waiting count notification.

2 OPERATION DEFINITIONS

2.39 MSInactive

(See [3], page 540-100)

The omitted portion of this section is retained without modification.

The MSInactive operation is initiated with a TCAP INVOKE (LAST). This is carried by a TCAP QUERY WITH PERMISSION package. The parameter set is encoded as follows:

MSInactive INVOKE Parameters				Timer: MSIT
Field	Value	Type	Reference	Notes
Identifier	SET [NATIONAL 18]	M	520-1.3.2.1	
Length	variable octets	M	520-1.3.2.1	
Contents				
ElectronicSerialNumber		M	2.112	
MSID		M	2.153	h
CallHistoryCount		O	2.26	a
DeregistrationType		O	2.101	b
DestinationDigits		O	2.103	g
LocationAreaID		O	2.135	c
MessageWaitingCountAcknowledged		O	6.5.2.xxx	i
SenderIdentificationNumber		O	2.215	d
ServicesResult		O	2.224	f
SMS_MessageWaitingIndicator		O	2.238	e

Notes:

- a. Include if MS registration is canceled and if the SSD is shared.
- b. Include from VLR to HLR and HLR to AC for MS deregistration.
- c. May be included from MSC-V to VLR. Usage in the HLR is not defined.
- d. May be included to identify the functional entity sending this message.
- e. Include to indicate that an SMS message is pending delivery.
- f. Include to indicate result of a PSID/RSID delivery to an MS.
- g. Include when received from MS in De-registration.

- h. Include the identifier with which the MS last accessed the system, unless that identifier was a MIN-based IMSI, in which case the MobileIdentificationNumber (populated with the MIN derived from that IMSI) should be included.
- i. Include to indicate the Message Waiting Count last acknowledged by the MS.

The remainder of this section is retained without modification.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

2.49 RegistrationCancellation

(See [3], page 540-123)

The omitted portion of this section is retained without modification.

The RegistrationCancellation operation success is reported with a TCAP RETURN RESULT (LAST). This is carried by a TCAP RESPONSE package. The Parameter Set is encoded as follows:

RegistrationCancellation RETURN RESULT Parameters				
Field	Value	Type	Reference	Notes
Identifier	SET [NATIONAL 18]	M	520-1.3.2.2	
Length	variable octets	M	520-1.3.2.2	
Contents				
CallHistoryCount		O	2.26	a
CancellationDenied		O	2.35	b
ControlChannelData		O	2.86	b
MessageWaitingCountAcknowledged		O	6.5.2.xxx	d
ReceivedSignalQuality		O	2.197	b
SMS_MessageWaitingIndicator		O	2.238	c
SystemAccessData		O	2.257	b

Notes:

- a. Include if SSD is shared.
- b. Include if registration cancellation is denied.
- c. Include to indicate that an SMS message is pending delivery.
- d. Include to indicate the Message Waiting Count last acknowledged by the MS.

MAP PARAMETERS SIGNALING PROTOCOL

This section provides the additions and modifications to the MAP parameters signaling protocol that are required for enhanced message waiting count notification.

1 GENERAL

1.2 Parameter Identifiers

(See [4], page 550-2)

Table 1 MAP Parameter Identifiers

Parameter Identifier Name	Parameter Identifier Code H G F E D C B A	Reference
•••		
<u>MessageWaitingCountAcknowledged</u>	<u>1 0 0 1 1 1 1 1</u> <u>1 0 0 0 0 0 1 1</u> <u>0 0 0 1 0 0 0 0</u>	<u>2.x.x.x</u>
•••		

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

2 PARAMETER DEFINITIONS

2.182 Profile

(See [4], page 550-245)

The Profile is a collection of the subscriber's calling profile information. This information is a list of optional parameters. The Profile macro has been defined solely for editorial convenience, and does not affect the encoding in any way.

Profile			
	Type	Reference	Notes
Contents			
•••			
<u>MessageWaitingCountAcknowledged</u>	O	<u>2.xxx</u>	<u>ae</u>
MessageWaitingNotificationCount	O	2.136	f
MessageWaitingNotificationType	O	2.137	g
•••			

Notes:

•••

- f. Include if MessageWaitingNotificationType is *Message Waiting Indication* and number of messages waiting is authorized.
- g. Include if Message Waiting Notification feature is active and a message is waiting.

•••

- ae. Include to indicate the Message Waiting Count last acknowledged by the MS.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

2.xxx MessageWaitingCountAcknowledged

(New for [4], Section 550)

The MessageWaitingCountAcknowledged (MWCACK) parameter indicates the message waiting count last acknowledged by the MS.

The minimum length of this parameter is two octets.

Field	Value	Type	Reference	Notes					
Identifier	MessageWaitingCount-Acknowledged IMPLICIT OCTET STRING	M	6.5.1.2						
Length	variable octets	M	6.5.1.1						
Contents									
H	G	F	E	D	C	B	A	octet	Notes
Type of messages								1	a
Number of Messages Acknowledged								2	a
• • •								<i>n</i>	b

Notes:

- a. These fields must occur in pairs and at least one pair must be included.
- b. There may be more occurrences of the octet pairs.

<i>Type of Message (octet 1)</i>	
Decimal Value	Meaning
0	Voice Messages.
1	Short Message Services (SMS) messages.
2	Group 3 (G3) Fax messages.
values through 254	Reserved. Treat the same as value 255, Not specified.
255	Type of messages not specified.
<i>Number of Messages Acknowledged (octet 2)</i>	
Decimal Value	Meaning
0	No messages were acknowledged.
1 through 253	Number of messages acknowledged.
254	254 or more messages were acknowledged.
255	Unknown. An unknown number of messages were acknowledged (greater than zero).

SIGNALING PROCEDURES

This section provides the additions and modifications to N.S0005 signaling procedures that are required for enhanced message waiting count notification.

3.1 Registration Call Tasks

3.1.3 Loading of Profile Parameters

(see [1], page 6-10)

Upon request, the HLR or VLR shall do the following:

- 1 Include the AuthenticationCapability parameter set appropriately.
- 2 Include the CallingFeaturesIndicator parameter set appropriately.
- 3 IF carrier selection digits are applicable:
 - 3-1 IF the Profile is supported for this transaction:
 - 3-1-1 Include the CarrierDigits parameter set to the carrier selection digits.
 - 3-2 ELSE:
 - 3-2-1 Include the Digits (Carrier) parameter set to the carrier selection digits.
 - 3-3 ENDIF.
 - 4 ENDIF.
- 5 IF default account code digits are applicable for calls by the subscriber:
 - 5-1 IF the Profile is supported for this transaction:
 - 5-1-1 Include the DMH_AccountCodeDigits parameter set to the appropriate default account code digits.
 - 5-2 ELSE:
 - 5-2-1 (Consider restricting originations.)
 - 5-3 ENDIF.
 - 6 ENDIF.
- 7 IF billing digits are applicable for calls by the subscriber:
 - 7-1 IF the Profile is supported for this transaction:
 - 7-1-1 Include the DMH_BillingDigits parameter set to the appropriate alternate billing digits.
 - 7-2 ELSE:
 - 7-2-1 (Consider restricting originations.)
 - 7-3 ENDIF.
 - 8 ELSEIF alternate billing digits are applicable for calls by the subscriber:
 - 8-1 IF the Profile is supported for this transaction:
 - 8-1-1 Include the DMH_AlternateBillingDigits parameter set to the appropriate alternate billing digits.
 - 8-2 ELSE:
 - 8-2-1 (Consider restricting originations.)

8-3	ENDIF.	1
9	ENDIF.	2
10	IF the subscriber's current privileges are geographically restricted:	3
		4
10-1	IF the Profile is supported for this transaction:	5
		6
10-1-1	Include the GeographicAuthorization parameter set appropriately.	7
		8
10-2	ELSE:	9
		10
10-2-1	(Consider restricting originations.)	11
		12
10-3	ENDIF.	13
11	ENDIF.	14
12	IF the subscriber is authorized for message waiting notification:	15
		16
12-1	IF the Profile is supported for this transaction:	17
		18
12-1-1	Include the MessageWaitingNotificationCount parameter set appropriately.	19
		20
12-1-2	Include the MessageWaitingNotificationType parameter set appropriately.	21
		22
<u>12-1-3</u>	<u>Include the MessageWaitingCountAcknowledged parameter set to the current</u>	23
	<u>Message Waiting Count Acknowledged value.</u>	24
		25
12-2	ENDIF.	26
13	ENDIF.	27
14	IF the MS is to be identified with a mobile directory number (other than its MIN):	28
		29
14-1	IF the Profile is supported for this transaction:	30
		31
14-1-1	Include the MobileDirectoryNumber parameter set to the subscriber's current	32
	directory number.	33
		34
14-2	ELSE:	35
		36
14-2-1	(Consider restricting originations and terminations or activating CNIR.)	37
		38
14-3	ENDIF.	39
15	ENDIF.	40
16	Include the OriginationIndicator parameter set appropriately.	41
		42
17	IF origination triggers are required:	43
		44
17-1	IF the Profile is supported for this transaction:	45
		46
17-1-1	Include the OriginationTriggers parameter set appropriately.	47
		48
17-2	ELSE:	49
		50
17-2-1	(Consider restricting originations.)	51
		52
17-3	ENDIF.	53
		54
18	ENDIF.	55
19	IF the subscriber is authorized for PACA:	56
		57
19-1	IF the Profile is supported for this transaction:	58
		59
19-1-1	Include the PACAIndicator parameter set appropriately.	60
19-2	ENDIF.	
20	ENDIF.	
21	IF the subscriber has a preferred language:	
21-1	IF the Profile is supported for this transaction:	
21-1-1	Include the PreferredLanguageIndicator parameter set appropriately.	

1 21-2 ENDIF.
2
3 22 ENDIF.
4
5 23 IF restriction digits are required (as requested by the OriginationIndicator parameter):
6
7 23-1 IF the Profile is supported for this transaction:
8
9 23-1-1 Include the RestrictionDigits parameter set to the restriction digits.
10
11 23-2 ELSE:
12
13 23-2-1 Include the Digits (Destination) parameter set to the restriction digits.
14
15 23-3 ENDIF.
16
17 24 ENDIF.
18
19 25 IF routing digits are applicable for all calls by the subscriber:
20
21 25-1 IF the Profile is supported for this transaction:
22
23 25-1-1 Include the RoutingDigits parameter set to the appropriate routing digits.
24
25 25-2 ELSE:
26
27 25-2-1 (Consider restricting originations.)
28
29 25-3 ENDIF.
30
31 26 ENDIF.
32
33 27 IF the MS is registered to an SMS capable system:
34
35 27-1 IF the Profile is supported for this transaction:
36
37 27-1-1 Include the SMS_OriginationRestrictions parameter set appropriately.
38
39 27-1-2 Include the SMS_TerminationRestrictions parameter set appropriately.
40
41 27-2 ELSE:
42
43 27-2-1 (Consider restricting originations.)
44
45 27-3 ENDIF.
46
47 28 ENDIF.
48
49 29 IF the current transaction supports local SPINI operation AND IF local SPINI operation is
50
51 desirable:
52
53 29-1 Include the SPINITriggers parameter set with the appropriate triggers for local SPINI
54
55 operation.
56
57 29-2 Include the SPINIPIN parameter set to the *SPINI PIN*.
58
59 30 ENDIF.
60
31 Include the TerminationRestrictionCode parameter set appropriately.
32 IF termination triggers are required:
32-1 IF the Profile is supported for this transaction:
32-1-1 Include the TerminationTriggers parameter set appropriately.
32-2 ELSE:
32-2-1 (Consider restricting terminations.)
32-3 ENDIF.
33 ENDIF.
34 Return to the calling task.

4.30 MS Inactive

4.30.1 MSC Initiating an MS Inactive

(see [1], page 6-197)
(see [5], page 51)

When the MSC detects an inactive MS, the Serving MSC shall do the following:

- 1 Include the MS's **MSID** and **ElectronicSerialNumber** parameters.
- 2 IF the MS's service profile contains the *Message Waiting Count Acknowledged*:
 - 2-1 Include the *MessageWaitingCountAcknowledged* parameter set to the *Message Waiting Count Acknowledged* value.
- 3 **ENDIF.**
- 4 **IF** the MS is being de-registered:
 - 4-1 Include the MS's **DeregistrationType** parameter indicating the appropriate type.
 - 4-2 **IF** the **SMS Delivery Pending Flag** is set for this MS:
 - 4-2-1 Include the **SMS_MessageWaitingIndicator** parameter.
 - 4-3 **ENDIF.**
 - 4-4 Remove the MS's record.
- 5 **ENDIF.**
- 6 Include the MS's **LocationAreaID** parameter.
- 7 **IF** an identification number is assigned to the MSC:
 - 7-1 Include the **SenderIdentificationNumber** parameter set to the MSC's ID.
- 8 **ENDIF.**
- 9 **IF**
 - 10 Send an **MSInactive INVOKE** to the MSC's associated VLR.
 - 11 Start the **MS Inactive Timer (MSIT)**.
 - 12 **WAIT** for an MS Inactive response:
 - 13 **WHEN** a **RETURN RESULT** is received:
 - 13-1 Stop timer (MSIT).
 - 13-2 **IF** the message cannot be processed:
 - 13-2-1 Execute the "Local Recovery Procedures" task (see 3.5.1).
 - 13-3 **ENDIF.**
 - 14 **WHEN** a **RETURN ERROR** or **REJECT** is received:
 - 14-1 Stop timer (MSIT).
 - 14-2 Execute the "Local Recovery Procedures" task (see 3.5.1).
 - 15 **WHEN** timer (MSIT) expires:
 - 15-1 Execute the "Local Recovery Procedures" task (see 3.5.1).
 - 16 **ENDWAIT.**
 - 17 Exit this task.

4.30.2 VLR Receiving MSInactive INVOKE

(see [1], page 6-198)

When a VLR receives an MSInactive INVOKE, it shall perform the following:

- 1 IF the received message can be processed:
 - 1-1 IF the MessageWaitingCountAcknowledged parameter was received:
 - 1-1-1 Update the indicated MS's service profile with the received MessageWaitingCountAcknowledged parameter value.
 - 1-2 ENDIF.
 - 1-3 Send a RETURN RESULT to the requesting MSC.
 - 1-4 Execute the "VLR Detection of MS Inactive" task (see 4.30.3).
- 2 ELSE (the received message cannot be processed):
 - 2-1 Send a RETURN ERROR with a proper Error Code value (see the following table) to the requesting MSC.
 - 3 ENDIF.
 - 4 Exit this task.

The remainder of this section is retained without modification.

4.30.3 VLR Detection of MS Inactivity

(see [1], page 6-199)
(see [5], page 51)

When the VLR determines that an MS is inactive by receiving an MSInactive INVOKE from an MSC or based on internal algorithms, the VLR shall do the following:

- 1 Include the MS's ElectronicSerialNumber parameter.
- 2 Include the MS's MSID parameter.
- 3 Set the MS's state to *inactive*.
- 4 IF SharedSecretData (SSD) is shared for this MS:
 - 4-1 IF the CallHistoryCount (COUNT) is available:
 - 4-1-1 Include the CallHistoryCount (COUNT) parameter.
 - 4-2 ENDIF.
 - 5 ENDIF.
- 6 IF the MS's service profile contains the Message Waiting CountAcknowledged:
 - 6-1 Include the MessageWaitingCountAcknowledged parameter set to the Message Waiting Count Acknowledged value.
 - 7 ENDIF.
- 8 IF the MS's record is to be removed from the VLR database:
 - 8-1 Include the MS's DeregistrationType parameter set to the appropriate deregistration type (this may be relayed from the MSC).
 - 8-2 Remove the MS's record from the VLR's database.
 - 9 ENDIF.
 - 10 Include the MS's LocationAreaID parameter.
 - 11 IF an identification number is assigned to the VLR:

- 11-1 Include the SenderIdentificationNumber parameter set to the VLR's ID. 1
- 12 ENDIF. 2
- 13 IF the SMS_MessageWaitingIndicator parameter is received: 3
- 13-1 Relay the received SMS_MessageWaitingIndicator parameter. 4
- 14 ENDIF. 5
- 15 Send an MSInactive INVOKE to the MS's HLR. 6
- 16 Start the MS Inactive Timer (MSIT). 7
- 17 WAIT for an MS Inactive response. 8
- 18 WHEN a RETURN RESULT is received: 9
- 18-1 Stop the timer (MSIT). 10
- 19 WHEN a RETURN ERROR or REJECT is received: 11
- 19-1 Stop the timer (MSIT). 12
- 19-2 Execute the "Local Recovery Procedures" task (see 3.5.1). 13
- 20 WHEN the timer (MSIT) expires: 14
- 20-1 Execute the "Local Recovery Procedures" task (see 3.5.1). 15
- 21 ENDWAIT. 16
- 22 Exit this task. 17

The remainder of this section is retained without modification.

4.30.4 HLR Receiving MSInactive INVOKE

(see [1], page 6-200)
(see [5], page 51)

When an HLR receives an MSInactive INVOKE, it shall perform the following:

- 1 IF the received message can be processed: 35
- 1-1 IF the MSID (MIN or IMSI) and the ElectronicSerialNumber of a registered MS are 36
- equal to the received MSID and ElectronicSerialNumber parameters, AND IF the 37
- requesting VLR is the VLR serving the MS: 38
- 1-1-1 Set the MS's state to inactive. 39
- 1-1-2 IF a DeregistrationType parameter is received: 40
- 1-1-2-1 Clear the HLR's pointer to the VLR serving the MS. 41
- 1-1-3 ENDIF. 42
- 1-1-4 IF the MessageWaitingCountAcknowledged parameter was received: 43
- 1-1-4-1 Update the indicated MS's service profile with the received 44
- MessageWaitingCountAcknowledged parameter value. 45
- 1-1-5 ENDIF. 46
- 1-1-6 Send a RETURN RESULT to the requesting VLR. 47
- 1-1-7 IF the CallHistoryCount (COUNT) parameter is received: 48
- 1-1-7-1 Relay the received parameters. 49
- 1-1-7-2 Send an MSInactive INVOKE to the MS's AC. 50
- 1-1-7-3 Start the MS Inactive Timer (MSIT). 51

1 1-1-7-4 WAIT for an MS Inactive response.
2
3 1-1-7-5 WHEN a RETURN RESULT is received:
4 1-1-7-5-1 Stop the timer (MSIT).
5
6 1-1-7-6 WHEN a RETURN ERROR or REJECT is received:
7 1-1-7-6-1 Stop the timer (MSIT).
8 1-1-7-6-2 Execute the “Local Recovery Procedures” task (see 3.5.1).
9
10 1-1-7-7 WHEN the timer (MSIT) expires:
11 1-1-7-7-1 Execute the “Local Recovery Procedures” task (see 3.5.1).
12
13 1-1-7-8 ENDWAIT.
14
15 1-1-8 ENDIF.
16 1-1-9 IF the SMS_MessageWaitingIndicator parameter is received:
17 1-1-9-1 Set the SMS Delivery Pending Flag for this MS.
18
19 1-1-10 ENDIF.
20 1-2 ELSE (MIN-ESN mismatch or VLR mismatch):
21 1-2-1 Send a RETURN RESULT (see the following table) to the VLR.
22
23 1-3 ENDIF.
24 2 ELSE (the message cannot be processed):
25 2-1 Send a RETURN ERROR with the proper Error Code value (see the following table)
26 to the VLR.
27
28 3 ENDIF.
29
30 4 Exit this task.

31
32 The remainder of this section is retained without modification.
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

4.37 Registration Cancellation

4.37.1 HLR Initiating Registration Cancellation

(see [1], page 6-229)

(see [5], page 53)

When an HLR detects that an MS is newly registered with a VLR that is different from the previously registered one, it shall perform the following:

- 1 Include the CancellationType parameter set to the type of cancellation desired.
- 2 IF applicable:
 - 2-1 Relay any received parameters from the RegistrationNotification INVOKE.
 - 3 ENDIF.
 - 4 Send a RegistrationCancellation INVOKE to the previously visited VLR.
 - 5 Start Registration Cancellation Timer (RCT).
 - 6 WAIT for a Registration Cancellation response:
 - 7 WHEN a RETURN RESULT is received:
 - 7-1 Stop timer (RCT).
 - 7-2 IF the message can be processed:
 - 7-2-1 IF the CancellationDenied parameter was not present:
 - 7-2-1-1 IF the MessageWaitingCountAcknowledged parameter was received from the previously visited VLR:
 - 7-2-1-1-1 Update the indicated MS's service profile with the received MessageWaitingCountAcknowledged parameter value.
 - 7-2-1-2 ENDIF.
 - 7-2-1-3 IF the CallHistoryCount (COUNT) parameter was received from the previously visited VLR:
 - 7-2-1-3-1 IF SharedSecretData (SSD) is shared with the previously visited VLR:
 - 7-2-1-3-1-1 IF the CallHistoryCount (COUNT) must be updated in the AC.
 - 7-2-1-3-1-1-1 Include the MSID parameter set to identify the MS.
 - 7-2-1-3-1-1-2 Include the ElectronicSerialNumber parameter set to identify the MS.
 - 7-2-1-3-1-1-3 Relay the received CallHistoryCount (COUNT) parameter.
 - 7-2-1-3-1-1-4 Send an MSInactive INVOKE to the MS's AC.
 - 7-2-1-3-1-1-5 Start the MS Inactive Timer (MSIT).
 - 7-2-1-3-1-1-6 WAIT for an MS Inactive Response:
 - 7-2-1-3-1-1-7 WHEN a RETURN RESULT is received:
 - 7-2-1-3-1-1-7-1 Stop the timer (MSIT).
 - 7-2-1-3-1-1-8 WHEN a RETURN ERROR or REJECT is received:
 - 7-2-1-3-1-1-8-1 Stop the timer (MSIT).
 - 7-2-1-3-1-1-8-2 Execute "Local Recovery Procedures" task (see 3.5.1).
 - 7-2-1-3-1-1-9 WHEN the timer (MSIT) expires:
 - 7-2-1-3-1-1-9-1 Execute "Local Recovery Procedures" task (see 3.5.1).

1 7-2-1-3-1-1-10 ENDWAIT.
2 7-2-1-3-1-2 ENDIF.
3 7-2-1-3-2 ENDIF.
4 7-2-1-4 ENDIF.
5 7-2-1-5 Clear the pointer to the previously visited VLR.
6 7-2-1-6 IF the SMS_MessageWaitingIndicator parameter was present:
7 7-2-1-6-1 Set the *SMS Delivery Pending Flag* for this MS.
8 7-2-1-7 ENDIF.
9 7-2-2 ELSE return the CancellationDenied parameter to the calling process.
10 7-2-3 ENDIF.
11 7-3 ELSE (the message cannot be processed):
12 7-3-1 Execute “Local Recovery Procedures” task (see 3.5.1).
13 7-4 ENDIF.
14 8 WHEN a RETURN ERROR or REJECT is received:
15 8-1 Stop timer (RCT).
16 8-2 Execute “Local Recovery Procedures” task (see 3.5.1).
17 9 WHEN timer (RCT) expires:
18 9-1 Execute “Local Recovery Procedures” task (see 3.5.1).
19 10 ENDWAIT.
20 11 Return to the calling task.

4.37.4 **MSC Receiving RegistrationCancellation INVOKE**

(see [1], page 6-233)

When an MSC receives a RegistrationCancellation INVOKE it shall perform the following:

1 IF the received message can be processed:
2-1 IF the CancellationType parameter is received:
2-1-1 IF the CancellationType is *Discontinue*:
2-1-1-1 IF the indicated MS is involved in a call or service operation anchored by this MSC:
2-1-1-1-1 The Serving System shall discontinue the call or service operation currently in progress.
2-1-1-1-2 ENDIF.
2-1-1-1-3 IF the *SMS Delivery Pending Flag* is set for the indicated MS:
2-1-1-1-3-1 Include the SMS_MessageWaitingIndicator parameter.
2-1-1-1-4 ENDIF.
2-1-1-1-5 IF the MS’s service profile contains the *Message Waiting Count Acknowledged*:
2-1-1-1-5-1 Include the MessageWaitingCountAcknowledged parameter set to the *Message Waiting Count Acknowledged* value.
2-1-1-1-6 ENDIF.
2-1-1-1-7 Remove the record of the indicated MS including the *SMS Delivery Pending Flag and Message Waiting Count Acknowledged*.

| | | |
|--------------------|--|----|
| 1-1-2 | ELSEIF the CancellationType is <i>ReportInCall</i> : | 1 |
| 1-1-2-1 | IF the indicated MS is involved in a call or service operation anchored by this MSC: | 2 |
| | | 3 |
| | | 4 |
| 1-1-2-1-1 | Include CancellationDenied parameter set to <i>Busy</i> . | 5 |
| | (Do not communicate the <i>SMS Delivery Pending Flag</i> state. | 6 |
| | | 7 |
| 1-1-2-2 | ELSE: | 8 |
| | | 9 |
| 1-1-2-2-1 | IF the <i>SMS Delivery Pending Flag</i> is set for the indicated MS: | 10 |
| 1-1-2-2-1-1 | Include the SMS_MessageWaitingIndicator parameter. | 11 |
| 1-1-2-2-2 | ENDIF. | 12 |
| | | 13 |
| <u>1-1-2-2-3</u> | <u>IF the MS's service profile contains the <i>Message Waiting Count Acknowledged</i>:</u> | 14 |
| | | 15 |
| <u>1-1-2-2-3-1</u> | <u>Include the MessageWaitingCountAcknowledged parameter set to the <i>Message Waiting Count Acknowledged</i> value.</u> | 16 |
| | | 17 |
| | | 18 |
| <u>1-1-2-2-4</u> | <u>ENDIF.</u> | 19 |
| 1-1-2-2-5 | Remove the record of the indicated MS including the <i>SMS Delivery Pending Flag</i> and <i>Message Waiting Count Acknowledged</i> . | 20 |
| | | 21 |
| | | 22 |
| 1-1-2-3 | ENDIF. | 23 |
| 1-1-3 | ELSEIF the indicated MS is involved in a call or service operation anchored by this MSC: | 24 |
| | | 25 |
| | | 26 |
| 1-1-3-1 | The Serving System may optionally discontinue the call or service operation currently in progress. | 27 |
| | | 28 |
| 1-1-3-2 | IF the <i>SMS Delivery Pending Flag</i> is set for the indicated MS: | 29 |
| 1-1-3-2-1 | Include the SMS_MessageWaitingIndicator parameter. | 30 |
| | | 31 |
| 1-1-3-3 | ENDIF. | 32 |
| | | 33 |
| <u>1-1-3-4</u> | <u>IF the MS's service profile contains the <i>Message Waiting Count Acknowledged</i>:</u> | 34 |
| | | 35 |
| <u>1-1-3-4-1</u> | <u>Include the MessageWaitingCountAcknowledged parameter set to the <i>Message Waiting Count Acknowledged</i> value.</u> | 36 |
| | | 37 |
| | | 38 |
| <u>1-1-3-5</u> | <u>ENDIF.</u> | 39 |
| 1-1-3-6 | Remove the record of the indicated MS including the <i>SMS Delivery Pending Flag</i> and <i>Message Waiting Count Acknowledged</i> . | 40 |
| | | 41 |
| | | 42 |
| 1-1-4 | ENDIF. | 43 |
| | | 44 |
| 1-2 | ELSE (CancellationType parameter was not included): | 45 |
| 1-2-1 | IF the indicated MS is involved in a call or service operation anchored by this MSC: | 46 |
| | | 47 |
| 1-2-1-1 | The Serving System may optionally discontinue the call or service operation currently in progress. | 48 |
| | | 49 |
| | | 50 |
| 1-2-2 | ENDIF. | 51 |
| 1-2-3 | IF the <i>SMS Delivery Pending Flag</i> is set for the indicated MS: | 52 |
| 1-2-3-1 | Include the SMS_MessageWaitingIndicator parameter. | 53 |
| | | 54 |
| 1-2-4 | ENDIF. | 55 |
| | | 56 |
| 1-2-5 | <u>IF the MS's service profile contains the <i>Message Waiting Count Acknowledged</i>:</u> | 57 |
| | | 58 |
| | | 59 |
| | | 60 |

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

- 1-2-5-1 Include the MessageWaitingCountAcknowledged parameter set to the Message Waiting Count Acknowledged value.
- 1-2-6 ENDIF.
- 1-2-7 Remove the record of the indicated MS including the *SMS Delivery Pending Flag* and *Message Waiting Count Acknowledged*.
- 1-3 ENDIF.
- 1-4 Send a RETURN RESULT to the requesting VLR.
- 2 ELSE (the received message cannot be processed):
- 2-1 Send a RETURN ERROR with a proper Error Code value (see the following table) to the requesting VLR.
- 3 ENDIF.
- 4 Exit this task.

4.38 Registration Notification

4.38.1 MSC Initiating MS Registration

(see [1], 6-233)
(see [5], page 53)

When an MSC determines that a roaming Mobile Station (MS) is now within its service area (through autonomous registration, call origination, call termination (e.g., a page response following a call to the roamer access number), or other mechanism, except for detection by a call handoff), this new Serving MSC shall start the registration notification process by doing the following:

- 1 Include the QualificationInformationCode parameter set according to the information needed from the VLR.
- 2 Include the SystemAccessType parameter set to the type of access performed by the MS.
- 3 IF the access occurred in a border cell:
 - 3-1 Include the BorderCellAccess parameter with a value of Border cell access.
 - 3-2 The MSC should include the ReceivedSignalQuality parameter set to the signal strength of the received access.
 - 3-3 The MSC should include the ControlChannelData parameter set to the Control Channel Identification information.
 - 3-4 The MSC should include the SystemAccessData parameter set to the cell site information.
- 4 ENDIF.
- 5 IF the MSC is authentication capable:
 - 5-1 Include the SystemCapabilities (SYSCAP) parameter set to indicate the authentication-related capabilities of this system.
- 6 ENDIF.
- 7 IF authentication parameters were requested (i.e., AUTH=1 in the Overhead Message Train), but were not received from the MS on the system access:
 - 7-1 Include the ReportType (RPTTYP) parameter indicating *Missing authentication parameters*.
- 8 ENDIF.
- 9 Include the ElectronicSerialNumber parameter set to identify the MS.
- 10 Include the MSID parameter set to identify the MS.
- 11 Include the MSCID parameter set to the identity of the MSC.
- 12 Include the SystemMyTypeCode parameter set to the MSC's manufacturer.
- 13 Include the TerminalType (TERMTYP) parameter as declared by the MS.
- 14 IF the MSC is sending the message to an SS7 network:
 - 14-1 Include the PC_SSN parameter with the Type set to *Serving MSC* and the PC and SSN fields set to the MSC's point code and subsystem number.
- 15 ENDIF.
- 16 IF the MS and MSC are SMS capable:
 - 16-1 Include the SMS_Address parameter set to be used to route SMS messages to the MS.
- 17 ENDIF.

1 18 IF the MSC supports local SPINI operation:
2
3 18-1 Include the TransactionCapability parameter indicating local SPINI operation
4 supported.
5 19 ENDIF.
6
7 20 IF the MS is intentionally inaccessible for normal Call Delivery for periods of time
8 (e.g., using a slotted mode, paging frame class, or sleep mode):
9 20-1 Include the AvailabilityType parameter set to *Unspecified mobile inactivity type*.
10
11 21 ENDIF.
12 22 Send a RegistrationNotification INVOKE to the MSC's associated VLR.
13 23 Start the Registration Notification Timer (RNT).
14 24 WAIT for a Registration Notification response:
15 25 WHEN a RETURN RESULT is received:
16 25-1 Stop timer (RNT).
17 25-2 IF the message can be processed:
18 25-2-1 IF the message contained an AuthorizationDenied parameter:
19 25-2-1-1 IF the indicated MS is involved in a call or service operation anchored by this
20 MSC:
21 25-2-1-1-1 The Serving System may optionally discontinue the call or service
22 operation currently in progress.
23 25-2-1-1-2 ENDIF.
24 25-2-1-1-3 IF a record exists for the indicated MS:
25 25-2-1-1-3-1 Clear the subscriber's profile.
26 25-2-1-1-4 ENDIF.
27 25-2-2 ELSE:
28 25-2-2-1 Update the MS's service profile and qualification information with the
29 received parameters.
30 25-2-2-2 IF the SMS_MessageWaitingIndicator parameter was received:
31 25-2-2-2-1 Set the *SMS Delivery Pending Flag* for this MS.
32 25-2-2-2-3 ENDIF.
33 25-2-2-4 IF the MessageWaitingCountAcknowledged parameter was received AND
34 IF the indicated MS's service profile does not contain the *Message Waiting*
35 *Count Acknowledged*:
36 25-2-2-4-1 Update the indicated MS's service profile with the received
37 MessageWaitingCountAcknowledged parameter value.
38 25-2-2-4-2 ENDIF.
39 25-2-2-5 Execute the "MSC MWN Status Change Invocation" task (see 5.13.9).
40 25-2-2-6 IF the indicated MS is involved in a call or service operation anchored by this
41 MSC:
42 25-2-2-6-1 IF the service profile parameters do not authorize the current call or
43 service operation:
44 25-2-2-6-1-1 The Serving System may optionally discontinue the call or service
45 operation currently in progress.
46 25-2-2-6-1-2 ENDIF.
47 25-2-2-6-2 ENDIF.
48
49
50
51
52
53
54
55
56
57
58
59
60

25-2-2-8 ENDIF. 1
25-2-3 ENDIF. 2
25-3 ELSE (the message cannot be processed): 3
25-3-1 Execute “Local Recovery Procedures” task (see 3.5.1). 4
25-4 ENDIF. 5
26 WHEN a RETURN ERROR OR REJECT is received: 6
26-1 Stop timer (RNT). 7
26-2 Execute “Local Recovery Procedures” task (see 3.5.1). 8
27 WHEN timer (RNT) expires: 9
27-1 Execute “Local Recovery Procedures” task (see 3.5.1). 10
28 ENDWAIT. 11
29 Exit this task. 12

4.38.2 VLR Receiving RegistrationNotification INVOKE

(see [1], page 6-235)
(see [6], page 72)

When a VLR receives a RegistrationNotification INVOKE, it shall perform the following:

1 IF the received message cannot be processed: 23
1-1 Send a RETURN ERROR with a proper Error Code value (see the following table) to 24
the requesting MSC. 25
1-2 Exit this task. 26
2 ENDIF. 27
3 IF the MS is not allowed to register (e.g., the MS is on a negative list or registration 28
attempts for the MS from same MSCID and LocationAreaID have failed in the recent past 29
or the request is within a denied authorization period): 30
3-1 Include the AuthorizationDenied parameter set to *Unspecified*. 31
3-2 Include the SystemMyTypeCode parameter set to the VLR’s manufacturer. 32
3-3 Send a RETURN RESULT to the requesting MSC. 33
3-4 Exit this task. 34
4 ENDIF. 35
(The MS is allowed to register.) 36
5 IF the SystemAccessType parameter indicates *Autonomous registration*: 37
5-1 IF the VLR detects a multiple access situation (e.g., due to unavailability of 38
SignalQuality data): 39
5-1-1 IF this registration is not the most desirable access: 40
5-1-1-1 Include the AuthorizationDenied parameter set to *Multiple Access*. 41
5-1-1-2 IF available: 42
5-1-1-2-1 Include the ReceivedSignalQuality, ControlChannelData and 43
SystemAccessData parameters set according to the values received with 44
the best RegistrationNotification INVOKE for this access. 45
5-1-1-3 ENDIF. 46
5-1-1-4 Include the SystemMyTypeCode parameter set to the VLR’s manufacturer. 47

1 5-1-1-5 Send a RETURN RESULT to the requesting MSC.
2 5-1-1-6 Exit this task.
3
4 5-1-2 ENDIF.
5
6 5-2 ENDIF.
7
8 6 ENDIF.
9 (The registration is acceptable according to the VLR's data.)
10 7 IF the ReceivedSignalQuality, ControlChannelData and SystemAccessData parameters are
11 received:
12 7-1 Record them.
13
14 8 ENDIF.
15 9 IF the LocationAreaID parameter was received:
16 9-1 Record the location area identifier. (Note changes for below.)
17
18 10 ENDIF.
19
20 11 Record the received MSCID as the identity of the MSC currently serving the MS. (Note
21 changes for below.)
22 12 IF the MS has registered with an MSC within the domain of the VLR:
23 12-1 IF the MSC currently serving the MS is not the MSC previously registered with the
24 VLR:
25
26 12-1-1 Execute the "VLR Initiating Registration Cancellation" task (see 4.37.3).
27
28 12-1-2 IF the MessageWaitingCountAcknowledged parameter was received with the
29 RegistrationCancellation RETURN RESULT:
30
31 12-1-2-1 Update the indicated MS's service profile information with the
32 MessageWaitingCountAcknowledged parameter value received from the
33 MSC.
34
35 12-1-3 ENDIF.
36 12-1-4 IF the SMS_MessageWaitingIndicator parameter was received with the
37 RegistrationCancellation RETURN RESULT:
38 12-1-4-1 Relay the SMS_MessageWaitingIndicator parameter (for the
39 RegistrationNotification INVOKE to be sent to the HLR).
40
41 12-1-4-2 GOTO Register the MS.
42
43 12-1-5 ENDIF.
44
45 12-2 ENDIF.
46 12-3 IF the AvailabilityType parameter is received:
47 12-3-1 IF the MS is in the *active state*:
48 12-3-1-1 GOTO Register the MS.
49
50 12-3-2 ENDIF.
51 12-4 ELSE (the AvailabilityType parameter is not received):
52 12-4-1 IF the MS is in the *inactive state*:
53 12-4-1-1 GOTO Register the MS.
54
55 12-4-2 ENDIF.
56
57 12-5 ENDIF.
58 (The MS has not changed its active or inactive state.)
59
60

| | | |
|-----------|---|----|
| 12-6 | IF the MS has changed Market IDs and the GeographicAuthorization parameter indicates that it was <i>Authorized for this MarketID only</i> : | 1 |
| | | 2 |
| 12-6-1 | GOTO Register the MS. | 3 |
| | | 4 |
| 12-7 | ELSEIF the MS has changed MSCs and the GeographicAuthorization parameter indicates that it was <i>Authorized for this MarketID and Switch Number only</i> . | 5 |
| | | 6 |
| | | 7 |
| 12-7-1 | GOTO Register the MS. | 8 |
| | | 9 |
| 12-8 | ELSEIF the MS has changed location areas within an MSC and the GeographicAuthorization parameter indicates that it was <i>Authorized for this LocationAreaID within a MarketID only</i> : | 10 |
| | | 11 |
| | | 12 |
| 12-8-1 | GOTO Register the MS. | 13 |
| | | 14 |
| 12-9 | ELSEIF the MS has changed cells within an MSC and the GeographicAuthorization parameter indicates that it was <i>Authorized for this cell only</i> : | 15 |
| | | 16 |
| 12-9-1 | GOTO Register the MS. | 17 |
| | | 18 |
| 12-10 | ENDIF. | 19 |
| | (The MS is geographically authorized.) | 20 |
| 12-11 | IF an SMS_Address parameter is received: | 21 |
| | | 22 |
| 12-11-1 | IF the SMS_Address is different than the current SMS temporary routing address: | 23 |
| 12-11-1-1 | GOTO Register the MS. | 24 |
| | | 25 |
| 12-11-2 | ENDIF. | 26 |
| | | 27 |
| 12-12 | ELSE: | 28 |
| | | 29 |
| 12-12-1 | IF an SMS temporary routing address exists: | 30 |
| 12-12-1-1 | Clear the SMS temporary routing address. | 31 |
| 12-12-1-2 | GOTO Register the MS (to report loss of SMS capability). | 32 |
| | | 33 |
| 12-12-2 | ENDIF. | 34 |
| | | 35 |
| 12-13 | ENDIF. | 36 |
| | | 37 |
| 12-14 | IF the MSCIdentificationNumber parameter is received: | 38 |
| | | 39 |
| 12-14-1 | IF the current serving MSC did not provide its MSCIdentificationNumber during registration: | 40 |
| 12-14-1-1 | GOTO Register the MS. | 41 |
| | | 42 |
| 12-14-2 | ENDIF. | 43 |
| | | 44 |
| 12-15 | ELSE (the MSCIdentificationNumber parameter is not received): | 45 |
| | | 46 |
| 12-15-1 | IF the MSC currently serving the MS did provide its MSCIdentificationNumber during registration: | 47 |
| 12-15-1-1 | GOTO Register the MS. | 48 |
| | | 49 |
| 12-15-2 | ENDIF. | 50 |
| | | 51 |
| 12-16 | ENDIF. | 52 |
| | | 53 |
| 12-17 | IF the information requested by the QualificationInformationCode is available: | 54 |
| | | 55 |
| 12-17-1 | IF the QualificationInformationCode indicates <i>Profile only</i> or <i>Validation and profile</i> : | 56 |
| 12-17-1-1 | Execute the “Loading of Profile Parameters” task (see 3.1.3). | 57 |
| | | 58 |
| 12-17-2 | ENDIF. | 59 |
| | | 60 |
| 12-17-3 | IF the QualificationInformationCode indicates <i>Validation only</i> or <i>Validation and profile</i> : | |

1 12-17-3-1 Include the AuthorizationPeriod parameter set appropriately.
2 12-17-4 ENDIF.
3
4 12-17-5 Send a RETURN RESULT to the requesting MSC.
5 12-17-6 Exit this task.
6
7 12-18 ENDIF.
8
9 13 ENDIF.
10 **Register the MS:**
11 14 IF the AvailabilityType parameter was received:
12 14-1 Set the MS's state to *inactive*.
13 15 ELSE:
14 15-1 Set the MS's state to *active*.
15 16 ENDIF.
16 17 IF the SMS_Address is received:
17 17-1 Optionally store it as the SMS temporary routing address.
18 18 ELSE:
19 18-1 Clear the SMS temporary routing address.
20 19 ENDIF.
21 20 IF available:
22 20-1 Relay the received BorderCellAccess, SignalQuality, ControlChannelData and
23 SystemAccessType parameters.
24 21 ENDIF.
25 22 Relay any parameters received in the RegistrationNotification INVOKE including the
26 MSCID.
27 23 IF the Serving MSC identity is not equal to the VLR's ID information:
28 23-1 Include the ExtendedMSCID (Serving) parameter set to the identity of the VLR.
29 24 ENDIF.
30 25 Include the SenderIdentificationNumber set to the identification number of the VLR.
31 26 IF the indicated MS's service profile contains the *Message Waiting Count Acknowledged*:
32 26-1 Include the MessageWaitingCountAcknowledged parameter set to the *Message*
33 *Waiting Count Acknowledged* value.
34 27 ENDIF.
35 28 IF the VLR is sending the message to an SS7 network:
36 28-1 Include the PC_SSN parameter with the Type field set to VLR and the PC and SSN
37 fields set to the VLR's point code and subsystem number.
38 29 ENDIF.
39 30 Send a RegistrationNotification INVOKE to the HLR associated with the MS.
40 31 Start the Registration Notification Timer (RNT).
41 32 WAIT for a Registration Notification response:
42 33 WHEN a RETURN RESULT is received:
43 33-1 Stop timer (RNT).
44 33-2 IF the message can be processed:
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

| | | |
|--------------|--|----|
| 33-2-1 | IF the AuthorizationDenied parameter was received: | 1 |
| 33-2-1-1 | Relay the received AuthorizationDenied parameter and other received parameters. | 2 |
| 33-2-1-2 | Include the SystemMyTypeCode parameter set to the VLR's manufacturer. | 3 |
| 33-2-1-3 | Send a RETURN RESULT to the requesting MSC. | 4 |
| 33-2-1-4 | IF a record exists for the MS. | 5 |
| 33-2-1-4-1 | Clear the subscriber's profile. | 6 |
| 33-2-1-5 | ENDIF. | 7 |
| 33-2-1-6 | IF the AuthorizationDenied parameter <u>indicates</u> indicated <i>Multiple Access</i> : | 8 |
| 33-2-1-6-1 | Remove the record of the MS. (Future registration attempts will be allowed.) | 9 |
| 33-2-1-7 | ELSE: | 10 |
| 33-2-1-7-1 | The VLR may create a record in its internal data structures to indicate <i>Authorization Denied</i> for the indicated MS to prevent repetitive Registration Notification attempts. | 11 |
| 33-2-1-7-2 | IF the DeniedAuthorizationPeriod parameter is received: | 12 |
| 33-2-1-7-2-1 | Record the <i>denied authorization period</i> to prevent repetitive RegistrationNotification attempts. | 13 |
| 33-2-1-7-3 | ELSE: | 14 |
| 33-2-1-7-3-1 | Record the <i>denied authorization period</i> according to the results of internal algorithms to prevent repetitive RegistrationNotification attempts. | 15 |
| 33-2-1-7-4 | ENDIF. | 16 |
| 33-2-1-8 | ENDIF. | 17 |
| 33-2-1-9 | Exit this task. | 18 |
| 33-2-2 | ENDIF. | 19 |
| 33-2-3 | IF no record exists for the indicated MS: | 20 |
| 33-2-3-1 | Create a record. | 21 |
| 33-2-4 | ENDIF. | 22 |
| 33-2-5 | Update validation and restriction information. | 23 |
| 33-2-6 | Optionally update the indicated MS's service profile information. | 24 |
| 33-2-7 | <u>IF the MessageWaitingCountAcknowledged parameter was received AND IF the indicated MS's service profile does not contain the <i>Message Waiting Count Acknowledged</i>:</u> | 25 |
| 33-2-7-1 | <u>Update the indicated MS's service profile with the received MessageWaitingCountAcknowledged parameter value.</u> | 26 |
| 33-2-8 | ENDIF. | 27 |
| 33-2-9 | IF the <i>SMS Delivery Pending Flag</i> is set for this MS: | 28 |
| 33-2-9-1 | Include the SMS_MessageWaitingIndicator parameter. | 29 |
| 33-2-10 | ENDIF. | 30 |
| 33-2-11 | Optionally include stored service profile parameters. | 31 |
| 33-2-12 | Relay any received parameters from the HLR. | 32 |
| 33-2-13 | Send a RETURN RESULT to the requesting MSC. | 33 |
| | | 34 |
| | | 35 |
| | | 36 |
| | | 37 |
| | | 38 |
| | | 39 |
| | | 40 |
| | | 41 |
| | | 42 |
| | | 43 |
| | | 44 |
| | | 45 |
| | | 46 |
| | | 47 |
| | | 48 |
| | | 49 |
| | | 50 |
| | | 51 |
| | | 52 |
| | | 53 |
| | | 54 |
| | | 55 |
| | | 56 |
| | | 57 |
| | | 58 |
| | | 59 |
| | | 60 |

1 33-3 ELSE (the message cannot be processed):
2
3 33-3-1 Execute “Local Recovery Procedures” task (see 3.5.1).
4 33-4 ENDIF.
5
6 34 WHEN a RETURN ERROR OR REJECT is received:
7 34-1 Stop timer (RNT).
8 34-2 CASE Error Code OF:
9
10 34-3 *ParameterError*:
11 34-3-1 IF the parameter was originated from the initiating network functional entity:
12
13 34-3-1-1 Send a RETURN ERROR with Error Code *ParameterError*.
14 34-3-2 ELSE:
15
16 34-3-2-1 Send a RETURN ERROR with Error Code *SystemFailure*.
17 34-3-3 ENDIF.
18 34-4 *OperationSequenceProblem*:
19 34-4-1 Send a RETURN ERROR with Error Code *OperationSequenceProblem*.
20 34-5 *DEFAULT*:
21 34-5-1 Send a RETURN ERROR with Error Code *SystemFailure*.
22 34-6 ENDCASE.
23 34-7 Execute “Local Recovery Procedures” task (see 3.5.1).
24
25 35 WHEN timer (RNT) expires:
26 35-1 Execute “Local Recovery Procedures” task (see 3.5.1).
27 36 ENDWAIT.
28 37 Exit this task.

4.38.3 HLR Receiving RegistrationNotification INVOKE

(see [1], page 6-241)

When an HLR receives a RegistrationNotification INVOKE, it shall perform the following:

- 1 IF the received message can be processed and the requested information can be made available for the indicated MS):
 - 1-1 IF the received SystemAccessType parameter indicates *Autonomous registration*:
 - 1-1-1 IF this RegistrationNotification is part of a multiple access situation (based on internal algorithms and local operating procedures):
 - 1-1-1-1 IF this is not the most desirable access:
 - 1-1-1-1-1 Include the AuthorizationDenied parameter set to *Multiple Access*.
 - 1-1-1-1-2 IF the measurement data is available:
 - 1-1-1-1-2-1 Include the ReceivedSignalQuality, ControlChannelData and SystemAccessData parameters set according to values received with the best RegistrationNotification INVOKE received for this access.
 - 1-1-1-1-3 ENDIF.
 - 1-1-1-1-4 Include the SystemMyTypeCode parameter set to the HLR’s manufacturer.
 - 1-1-1-1-5 Send a RETURN RESULT to the requesting VLR.
 - 1-1-1-1-6 Exit this task.

| | | |
|--------------------|--|----|
| 1-1-1-2 | ENDIF. | 1 |
| 1-1-2 | ENDIF. | 2 |
| 1-2 | ENDIF. | 3 |
| 1-3 | IF the MS is authorized for service on this MSC: | 4 |
| 1-3-1 | Update the current VLR location of the MS. | 5 |
| 1-3-2 | IF the MS is registered with a different VLR: | 6 |
| 1-3-2-1 | IF the received SystemAccessType parameter indicates <i>Autonomous registration</i> : | 7 |
| 1-3-2-1-1 | IF the measurement data is available: | 8 |
| 1-3-2-1-1-1 | Include the ReceivedSignalQuality, ControlChannelData and SystemAccessData parameters according to the values received with the best RegistrationNotification INVOKE received for this access. | 9 |
| 1-3-2-1-2 | ENDIF. | 10 |
| 1-3-2-2 | ENDIF. | 11 |
| 1-3-2-3 | Execute the “HLR Initiating Registration Cancellation” task (see 4.37.1). | 12 |
| 1-3-2-4 | IF the CancellationDenied parameter is received: | 13 |
| 1-3-2-4-1 | Include the AuthorizationDenied parameter set to <i>Multiple Access</i> . | 14 |
| 1-3-2-4-2 | IF the measurement data is available: | 15 |
| 1-3-2-4-2-1 | Relay the ReceivedSignalQuality, ControlChannelData and SystemAccessData parameters. | 16 |
| 1-3-2-4-3 | ENDIF. | 17 |
| 1-3-2-4-4 | Restore the current VLR location of the MS. | 18 |
| 1-3-2-4-5 | Include the SystemMyTypeCode parameter set to the HLR’s manufacturer. | 19 |
| 1-3-2-4-6 | Send a RETURN RESULT to the requesting VLR. | 20 |
| 1-3-2-4-7 | Exit this task. | 21 |
| 1-3-2-5 | ELSE (no CancellationDenied parameter received): | 22 |
| 1-3-2-5-1 | Relay any received parameters, except the SMS_MessageWaitingIndicator parameter, from the RegistrationCancellation RETURN RESULT. | 23 |
| <u>1-3-2-5-2</u> | <u>IF the MessageWaitingCountAcknowledged parameter was received:</u> | 24 |
| <u>1-3-2-5-2-1</u> | <u>Update the indicated MS’s service profile with the received MessageWaitingCountAcknowledged parameter value.</u> | 25 |
| <u>1-3-2-5-3</u> | <u>ENDIF.</u> | 26 |
| 1-3-2-6 | ENDIF. | 27 |
| 1-3-3 | ELSE (the MS is registered with the same VLR): | 28 |
| 1-3-3-1 | IF an SMS_MessageWaitingIndicator parameter was received: | 29 |
| 1-3-3-1-1 | Set the <i>SMS Delivery Pending Flag</i> for this MS. | 30 |
| 1-3-3-2 | ENDIF. | 31 |
| <u>1-3-3-3</u> | <u>IF the MessageWaitingCountAcknowledged parameter was received:</u> | 32 |
| <u>1-3-3-3-1</u> | <u>Update the indicated MS’s service profile with the received MessageWaitingCountAcknowledged parameter value.</u> | 33 |
| | | 34 |
| | | 35 |
| | | 36 |
| | | 37 |
| | | 38 |
| | | 39 |
| | | 40 |
| | | 41 |
| | | 42 |
| | | 43 |
| | | 44 |
| | | 45 |
| | | 46 |
| | | 47 |
| | | 48 |
| | | 49 |
| | | 50 |
| | | 51 |
| | | 52 |
| | | 53 |
| | | 54 |
| | | 55 |
| | | 56 |
| | | 57 |
| | | 58 |
| | | 59 |
| | | 60 |

1 1-3-3-4 ENDIF.

2

3 1-3-4 ENDIF.

4 1-3-5 IF the QualificationInformationCode indicates *Profile only* or *Validation and*

5 profile:

6

7 1-3-5-1 Execute the “Loading of Profile Parameters” task (see 3.1.3).

8 1-3-6 ENDIF.

9

10 1-3-7 IF the QualificationInformationCode indicates *Validation only* or *Validation and*

11 profile:

12

13 1-3-7-1 Include the AuthorizationPeriod parameter set appropriately.

14 1-3-8 ENDIF.

15 1-3-9 IF an SMS_Address parameter is received with the RegistrationNotification

16 INVOKE:

17

18 1-3-9-1 IF an AvailabilityType parameter is NOT received with the

19 RegistrationNotification INVOKE:

20 1-3-9-1-1 IF SMS service is authorized for the MS on the current serving system:

21 1-3-9-1-1-1 IF the *SMS Delivery Pending Flag* is set for this MS:

22 1-3-9-1-1-1-1 Include the SMS_MessageWaitingIndicator parameter.

23 1-3-9-1-1-2 ENDIF.

24 1-3-9-1-2 ENDIF.

25 1-3-9-2 ENDIF.

26 1-3-10 ENDIF.

27

28 1-4 ELSE (the MS is not authorized for service):

29

30 1-4-1 Include the AuthorizationDenied parameter set to the proper value (see the

31 following table):

32 1-4-2 IF applicable:

33 1-4-2-1 Include the DeniedAuthorizationPeriod parameter set appropriately.

34 1-4-3 ENDIF

35 1-5 ENDIF.

36

37 1-6 Include the SystemMyTypeCode parameter set to the HLR’s manufacturer.

38 1-7 Send a RETURN RESULT to the requesting VLR.

39 1-8 IF an SMS_Address parameter was received in the RegistrationNotification INVOKE

40 (this sequence is repeated only so that the SMSNotification is sent after the

41 RegistrationNotification RETURN RESULT):

42 1-8-1 IF an AvailabilityType parameter was NOT received with the

43 RegistrationNotification INVOKE:

44 1-8-1-1 IF SMS service is authorized for the MS on the current serving system:

45 1-8-1-1-1 Optionally set the temporary SMS routing address to the received

46 SMS_Address.

47 1-8-1-1-2 IF the *SMS Delivery Pending Flag* is set for this MS:

48 1-8-1-1-2-1 Clear the *SMS Delivery Pending Flag*.

49 1-8-1-1-2-2 Execute the “HLR Initiating SMSNotification INVOKE” task

50 (see 4.47.1).

51 1-8-1-1-3 ENDIF.

52

53

54

55

56

57

58

59

60

- 1-8-1-2 ELSE (SMS service is not authorized for the current system): 1
- 1-8-1-2-1 GOTO SMS Not Available. 2
- 1-8-1-3 ENDIF. 3
- 1-8-2 ELSE (AvailabilityType parameter was received): 4
- 1-8-2-1 GOTO SMS Not Available. 5
- 1-8-3 ENDIF. 6
- 1-9 ELSE (no SMS_Address parameter was received): 7
- SMS Not Available:** 8
- The following step is incorrectly numbered in TIA/EIA/41.6-D.

9
- 1-9-1 Set the SMS status to *unavailable*. 10
- 1-9-2 Clear the temporary SMS routing address. 11
- 1-9-3 Optionally, IF the MC is to be informed of MS unavailability: 12
- 1-9-3-1 Include the SMS_AccessDeniedReason parameter set to *Unavailable*. 13
- 1-9-3-2 Execute the “HLR Initiating SMSNotification INVOKE” task (see 4.47.1). 14
- 1-9-4 ENDIF. 15
- 1-10 ENDIF. 16
- 1-11 IF an AvailabilityType parameter was received in the RegistrationNotification 17
- INVOKE: 18
- 1-11-1 Set the MS’s state to *inactive*. 19
- 1-12 ELSE: 20
- 1-12-1 Set the MS’s state to *active*. 21
- 1-13 ENDIF. 22
- 2 ELSE (the received message cannot be processed or the requested information cannot be 23
- made available for the indicated MS): 24
- 2-1 Send a RETURN ERROR with a proper Error Code value (see the following table) to 25
- the requesting VLR. 26
- 3 ENDIF. 27
- 4 Exit this task. 28

5.13 Message Waiting Notification (MWN)

5.13.6 HLR MWN Status Change Invocation

(see [1], page 6-350)

When the HLR detects a change to the MWN status for an MS, it shall perform the following:

1 IF the subscriber has MWN Alert Pip Tone, Pip Tone, or MS Indication active:

1-1 IF the MWN count has changed to zero:

1-1-1 Clear the *MWN Pip Tone Notification* indication.

1-1-2 Clear the *MWN Alert Pip Tone Notification* indication.

1-1-3 Clear the *MWN MS Indication* indication.

1-1-4 Execute a “HLR Initiating a Qualification Directive” task (see 4.32.1).

1-2 ELSEIF the MWN count has changed from zero:

1-2-1 IF the subscriber has MWN Pip Tone Active:

1-2-1-1 Set the *MWN Pip Tone Notification* indication.

1-2-2 ENDIF.

1-2-3 IF the subscriber has *MWN MS Indication* Active:

1-2-3-1 Set the *MWN MS Indication* indication.

1-2-4 ENDIF.

1-2-5 Execute a “HLR Initiating a Qualification Directive” task (see 4.32.1).

1-3 ELSE:

1-3-1 (Ignore the change.)

1-4 ENDIF.

2 ELSEIF the subscriber has the MWN MS Count active:

2-1 Execute a “HLR Initiating a Qualification Directive” task (see 4.32.1).

3 ELSE:

3-1 (Ignore the change.)

4 ENDIF.

5 Exit this task.

5.13.9 MSC MWN Status Change Invocation

(see [1], page 6-351)

Upon request, the MSC shall do the following:

1 IF a MessageWaitingNotificationCount or MessageWaitingNotificationType parameter is received:

1-1 IF the MS is served by the current system:

1-1-1 IF the MessageWaitingNotificationCount parameter was received:

1-1-1-1 IF the *Message Waiting Count Acknowledged* is not set for the indicated MS:

1-1-1-1-1 Order the MS to update its message waiting notification count(s).

1-1-1-2 ELSE (the *Message Waiting Count Acknowledged* is set for the indicated MS):

| | | |
|----------------------|---|----|
| <u>1-1-1-2-1</u> | <u>IF the received MessageWaitingNotificationCount parameter value is not equal to the MS's Message Waiting Count Acknowledged:</u> | 1 |
| | | 2 |
| <u>1-1-1-2-1-1</u> | <u>Order the MS to update its message waiting notification count(s).</u> | 3 |
| <u>1-1-1-2-1-2</u> | <u>IF the MS acknowledged the order:</u> | 4 |
| | | 5 |
| <u>1-1-1-2-1-2-1</u> | <u>Set the Message Waiting Count Acknowledged to the message waiting notification count(s) sent to the MS.</u> | 6 |
| | | 7 |
| | | 8 |
| <u>1-1-1-2-1-3</u> | <u>ENDIF.</u> | 9 |
| | | 10 |
| <u>1-1-1-2-2</u> | <u>ENDIF.</u> | 11 |
| | | 12 |
| <u>1-1-1-3</u> | <u>ENDIF.</u> | 13 |
| | | 14 |
| <u>1-1-1-1</u> | <u>Order the MS to update its message waiting notification count(s).</u> | 15 |
| <u>1-1-2</u> | <u>ENDIF.</u> | 16 |
| <u>1-1-3</u> | <u>IF the Message Waiting Indication is requested by the MessageWaitingNotificationType parameter:</u> | 17 |
| | | 18 |
| <u>1-1-3-1</u> | <u>Order the MS to update its message waiting notification indicator.</u> | 19 |
| <u>1-1-4</u> | <u>ENDIF.</u> | 20 |
| <u>1-1-5</u> | <u>IF the Alert Pip Tone is requested by the MessageWaitingNotificationType parameter:</u> | 21 |
| | | 22 |
| <u>1-1-5-1</u> | <u>IF the indicated MS is idle:</u> | 23 |
| | | 24 |
| <u>1-1-5-1-1</u> | <u>Order the MS to alert with the alert pip tone.</u> | 25 |
| <u>1-1-5-2</u> | <u>ENDIF.</u> | 26 |
| <u>1-1-6</u> | <u>ENDIF.</u> | 27 |
| | | 28 |
| <u>1-2</u> | <u>ELSEIF the MS has been handed off to another system:</u> | 29 |
| | | 30 |
| <u>1-2-1</u> | <u>IF the MessageWaitingNotificationCount parameter was received:</u> | 31 |
| | | 32 |
| <u>1-2-1-1</u> | <u>Relay the received MessageWaitingNotificationCount parameter.</u> | 33 |
| <u>1-2-2</u> | <u>ENDIF.</u> | 34 |
| | | 35 |
| <u>1-2-3</u> | <u>IF the Message Waiting Indication is requested by the MessageWaitingNotificationType parameter:</u> | 36 |
| | | 37 |
| <u>1-2-3-1</u> | <u>Relay the received MessageWaitingNotificationType parameter.</u> | 38 |
| <u>1-2-4</u> | <u>ENDIF.</u> | 39 |
| | | 40 |
| <u>1-2-5</u> | <u>IF a parameter has been relayed:</u> | 41 |
| | | 42 |
| <u>1-2-5-1</u> | <u>Execute the "MSC Initiating an Information Forward" task (see 4.23.1).</u> | 43 |
| <u>1-2-6</u> | <u>ENDIF.</u> | 44 |
| | | 45 |
| <u>1-3</u> | <u>ENDIF.</u> | 46 |
| | | 47 |
| <u>2</u> | <u>ENDIF.</u> | 48 |
| | | 49 |
| <u>3</u> | <u>Return to calling task.</u> | 50 |
| | | 51 |
| | | 52 |
| | | 53 |
| | | 54 |
| | | 55 |
| | | 56 |
| | | 57 |
| | | 58 |
| | | 59 |
| | | 60 |