**3GPP TSG-CT WG6 Meeting #119bis *C6-240504***

**Maastricht, Netherlands; 20th – 23rd August 2024**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **31.124** | **CR** | **0766** | **rev** | **1** | **Current version:** | **17.3.0** |  |
|  | | | | | | | | |
| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)*** *on using this form: comprehensive instructions can be found at  <http://www.3gpp.org/Change-Requests>.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps | **x** | ME | **x** | Radio Access Network | **x** | Core Network | **x** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Add testcase of IMSI changing procedure with USIM Application Reset for NG-RAN | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | China Mobile | | | | | | | | | |
| ***Source to TSG:*** | CT6 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | UEConTest\_R16 | | | | |  | ***Date:*** | | | 2024-08-21 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Normal USIM Application Reset procedure is carried out when an EFIMSI is changed via Data Download or a USAT application and a REFRESH command is issued by the UICC, and the test procedure about this case should be added for NG-RAN. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add testcase of IMSI changing procedure with USIM Application Reset for NG-RAN. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The test cases for IMSI changing procedure are not fully covered in NG-RAN. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.4, 27.22.4.7.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | C6-240447 | | | | | | | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*start of changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

## 3.4 Applicability table

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **27.22.4.6** |  | **POLL INTERVAL** |  |  |  |  |  |  |  |
|  | 1.1 | duration | R99 |  | M | E.1/22 | No |  |  |
| **27.22.4.7** |  | **REFRESH** |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **27.22.4.7** |  | **REFRESH** |  |  |  |  |  |  |  |
|  | 1.1 | USIM initialization, enabling FDN mode | R99 | Rel-7 | C146 AND  C177 AND  C178 AND  C180 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | Rel-8 |  | C146 AND  C177 AND  C178 AND  C180 AND  C183 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | 1.2 | file change notification of FDN file | R99 | Rel-7 | C146 AND  C177 AND  C178 AND  C180 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | Rel-8 |  | C146 AND  C177 AND  C178 AND  C180 AND  C183 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | 1.3 | USIM initialization and file change notification of ADN | R99 | Rel-5 | C168 AND  C177 AND  C178 | E.1/24 AND  E.1/110 AND  E.1/111 | No |  |  |
|  | Rel-6 |  | C177 AND  C178 | E.1/24 AND  E.1/110 AND  E.1/111 | No |  |  |
|  | 1.4 | USIM initialization and full file change notification, enabling FDN mode | R99 | Rel-7 | C146 AND  C177 AND  C178 AND  C180 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | Rel-8 |  | C146 AND  C177 AND  C178 AND  C180 AND  C183 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | 1.5 | UICC reset | R99 |  |  | E.1/24 | No |  |  |
|  | 1.6 | USIM Initialization after SMS-PP data download | R99 | Rel-7 | C146 AND  C177 AND  C178 AND  C180 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | Rel-8 |  | C146 AND  C177 AND  C178 AND  C180 AND  C183 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | 1.7 | USIM Application Reset | R99 | Rel-5 |  | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | Rel-6 | Rel-7 | C146 AND  C177 AND  C178 AND  C180 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | Rel-8 |  | C146 AND  C177 AND  C178 AND  C180 AND  C183 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | 2.1 | UICC Reset for IMSI Changing procedure | R99 | Rel-7 |  | E.1/24 | USS or  SS only |  |  |
|  | Rel-8 |  | M | E.1/24 | USS or  SS only |  |  |
|  | 2.2 | USIM Application Reset for IMSI Changing procedure | R99 | Rel-5 |  | E.1/24 | Yes |  |  |
|  | Rel-6 |  | M | E.1/24 | Yes |  |  |
|  | 2.3 | 3G Session Reset for IMSI Changing procedure | R99 | Rel-7 |  | E.1/24 | USS or  SS only |  |  |
|  | Rel-8 |  | M | E.1/24 | USS or  SS only |  |  |
|  | 2.4 | reject 3G Session Reset for IMSI Changing procedure during CScall | R99 | Rel-5 |  | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | Rel-6 | Rel-7 | C177 AND  C178 AND  C180 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | Rel-8 |  | C177 AND  C178 AND  C180 AND  C183 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | 2.5 | reject UICC Reset for IMSI Changing procedure during CS call | R99 | Rel-7 |  | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | Rel-8 |  | C177 AND  C178 AND  C180 AND  C183 | E.1/24 AND  E.1/110 AND  E.1/111 | USS or  SS only |  |  |
|  | 2.6 | UICC Reset for IMSI Changing procedure during active PDP context | R99 | Rel-7 |  | E.1/24 | USS or  SS only |  |  |
|  | Rel-8 |  | C215 | E.1/24 | USS or  SS only |  |  |
|  | 2.7 | 3G Session Reset for IMSI Change procedure during active PDP context | R99 | Rel-7 |  | E.1/24 | USS or  SS only |  |  |
|  | Rel-8 |  | C215 | E.1/24 | USS or  SS only |  |  |
|  | 3.1 | Steering of roaming, UTRAN | Rel-7 | Rel-7 | M | E.1/24 AND  E.1/236 | USS only |  |  |
|  | Rel-8 |  | C184 | E.1/24 AND  E.1/236 | USS only |  |  |
|  | 3.2 | Steering of roaming, InterRAT | Rel-7 | Rel-7 | C167 | E.1/24 AND  E.1/236 | USS and  SS |  |  |
|  | Rel-8 |  | C167 AND  C184 | E.1/24 AND  E.1/236 | USS and  SS |  |  |
|  | 3.3 | Steering of roaming, E-UTRAN | Rel-8 | Rel-12 | C190 | E.1/24 AND  E.1/135 AND  E.1/236 | E-USS or  NB-SS  (See NOTE) |  |  |
|  | Rel-13 |  | C222 | E.1/24 AND  E.1/135 AND  E.1/236 | E-USS or  NB-SS  (See NOTE) |  |  |
|  | 3.4 | Steering of roaming, NG-RAN | Rel-16 |  | C231 | E.1/24 AND  E.1/236 | NG-SS only |  |  |
|  | 4.1 | Refresh with AID, E-UTRAN or UTRAN | Rel-7 | Rel-7 | C203 | E.1/24 | E-USS only or  USS |  |  |
|  | Rel-8 |  | C202 OR  C203 | E.1/24 | E-USS only or  USS |  |  |
|  | 5.1 | UICC Reset for IMSI Changing procedure, E-UTRAN | Rel-8 |  | C190 | E.1/24 | E-USS or  NB-SS  (See NOTE) |  |  |
|  | 5.2 | 3G Session Reset for IMSI Changing procedure, E-UTRAN | Rel-8 |  | C190 | E.1/24 | E-USS or  NB-SS  (See NOTE) |  |  |
|  | 6.1 | REFRESH, UICC Reset for IMSI Changing procedure, NG-RAN | Rel-16 |  | C231 | E.1/24 OR  (E.1/24 AND  E.1/256) | NG-SS only |  |  |
|  | 6.2 | REFRESH, 3G Session Reset for IMSI Changing procedure, NG-RAN | Rel-16 |  | C231 | E.1/24 OR  (E.1/24 AND  E.1/256) | NG-SS only |  |  |
|  | 6.X | REFRESH, USIM Application Reset for IMSI Changing procedure, NG-RAN | Rel-16 |  | C231 | E.1/24 OR  (E.1/24 AND  E.1/256) | NG-SS only |  |  |
|  | 7.1 | REFRESH, UICC Reset for SUPI\_NAI Changing procedure, NG-RAN | Rel-16 |  | C231 AND  C233 | E.1/24 | NG-SS only |  |  |
|  | 7.2 | REFRESH, 3G Session Reset for SUPI\_NAI Changing procedure, NG-RAN | Rel-16 |  | C231 AND  C233 | E.1/24 | NG-SS only |  |  |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*next of changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

##### 27.22.4.7.6 REFRESH (IMSI changing procedure, NG-RAN)

27.22.4.7.6.1 Definition and applicability

See clause 3.2.2.

27.22.4.7.6.2 Conformance requirement

The ME shall support the REFRESH command as defined in:

- TS 31.111 [15] clause 6.1, clause 6.4.7, clause 6.4.7.1, clause 6, clause 6.6.13, clause 5.2, clause 8.6, clause 8.7 and clause 8.18.

Additionally, the ME shall support the USIM Initialization and USIM application closure procedure as defined in:

- TS 31.102 [14] clause 5.1.2, clause 5.1.3 and Annex I.

27.22.4.7.6.3 Test purpose

To verify that the ME performs the Proactive Command – REFRESH in accordance with the Command Qualifier and the IMSI changing procedure. This may require the ME to perform:

- the USIM initialization

- a re-read of the contents and structure of the IMSI on the USIM

- a restart of the card session

- a successful return of the result of the execution of the command in the TERMINAL RESPONSE command sent to the UICC.

27.22.4.7.6.4 Method of test

27.22.4.7.6.4.1 Initial conditions

The ME is connected to the USIM Simulator and connected to the NG-SS.

The NG-RAN parameters of the NG-SS are:

- Mobile Country Code (MCC) = 001;

- Mobile Network Code (MNC) = 01;

- Tracking Area Code (TAC) = 000001;

The default NG-RAN UICC is used.

Prior to this test the ME shall have been powered on and performed the PROFILE DOWNLOAD procedure.

27.22.4.7.6.4.2 Procedure

Expected Sequence 6.1 (REFRESH, UICC Reset for IMSI Changing procedure, NG-RAN)

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Direction | MESSAGE / Action | Comments |
| 1 | ME → NG-SS | ME successfully REGISTER with NG-RAN cell. |  |
| 2 | UICC → ME | PROACTIVE COMMAND PENDING: REFRESH 6.1.1 or REFRESH 6.1.2 | [To inform the ME that IMSI has changed] |
| 3 | ME → UICC | FETCH |  |
| 4 | UICC → ME | PROACTIVE COMMAND: REFRESH 6.1.1 or REFRESH 6.1.2 | IF terminal supports PD\_Refresh\_Enforcement\_Policy use PROACTIVE COMMAND: REFRESH 6.1.2 ELSE REFRESH 6.1.1. |
| 5 | ME→NG-SS | Deregistration Request |  |
| 6 | ME → UICC | STATUS[P1='02'] | ME indicates to USIM that the termination procedure is starting |
| 7 | ME → UICC | ME performs UICC reset. | Both cold and warm resets are allowed |
| 8 | UICC | Update EFIMSI and EF5GS3GPPLOCI. | The content of EFIMSI has been changed to "246813579" and the 5G-GUTI in EF5GS3GPPLOCI is updated to 'FF FF FF FF FF FF FF FF FF FF FF FF FF'. |
| 9 | ME→UICC | ME performs USIM Initialization, including send STATUS[P1='01'] and no TERMINAL RESPONSE shall be sent. | [ME resets and performs USIM initialization] |
| 10 | ME→NG-SS | Registration Request | The ME will register using IMSI "246813579" in NG-RAN. |
| 11 | NG-SS→ME | Registration Accept |  |
| 12 | ME→NG-SS | Registration Complete |  |

PROACTIVE COMMAND: REFRESH 6.1.1

Logically:

Command details

Command number: 1

Command type: REFRESH

Command qualifier: UICC RESET

Device identities

Source device: UICC

Destination device: ME

Coding:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BER-TLV: | D0 | 09 | 81 | 03 | 01 | 01 | 04 | 82 | 02 | 81 | 82 |

PROACTIVE COMMAND: REFRESH 6.1.2

Logically:

Command details

Command number: 1

Command type: REFRESH

Command qualifier: UICC RESET

Device identities

Source device: UICC

Destination device: ME

Refresh enforcement policy: Force immediate REFRESH even if the terminal is busy on data call

Coding:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BER-TLV: | D0 | 0C | 81 | 03 | 01 | 01 | 04 | 82 | 02 | 81 | 82 | 3A |
|  | 01 | 02 |

Expected Sequence 6.2 (REFRESH, 3G Session Reset for IMSI Changing procedure, NG-RAN)

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Direction | MESSAGE / Action | Comments |
| 1 | ME → NG-SS | ME successfully REGISTER with NG-RAN cell. |  |
| 2 | UICC→ ME | PROACTIVE COMMAND PENDING: REFRESH 6.2.1 or REFRESH 6.2.2 | [To inform the ME that IMSI has changed] |
| 3 | ME → UICC | FETCH |  |
| 4 | UICC → ME | PROACTIVE COMMAND: REFRESH 6.2.1 or REFRESH 6.2.2 | IF terminal supports PD\_Refresh\_Enforcement\_Policy use PROACTIVE COMMAND:REFRESH 6.2.2 ELSE REFRESH 6.2.1. |
| 5 | ME→NG-SS | Deregistration Request |  |
| 6 | ME → UICC | STATUS[P1='02'] | If A.1/172 is supported, then the ME indicates to USIM that the termination procedure is starting, completes the 3G session termination procedure and resets the application via SELECT by DF name command with the AID.  The ME performs the USIM initialization. |
| 7 | UICC | Update EFIMSI and EF5GS3GPPLOCI | The content of EFIMSI has been updated to "246813579" and 5G-GUTI in EF5GS3GPPLOCI is updated to 'FF FF FF FF FF FF FF FF FF FF FF FF FF' |
| 8 | ME → UICC | TERMINAL RESPONSE: REFRESH 6.2.1A or TERMINAL RESPONSE: REFRESH 6.2.1B | [normal ending] |
| 9 | UICC → ME | PROACTIVE UICC SESSION ENDED |  |
| 10 | ME→NG-SS | Registration Request | The ME will register using IMSI "246813579" in NG-RAN. |
| 11 | NG-SS→ME | Registration Accept |  |
| 12 | ME→NG-SS | Registration Complete |  |

PROACTIVE COMMAND: REFRESH 6.2.1

Logically:

Command details

Command number: 1

Command type: REFRESH

Command qualifier: 3G Session Reset

Device identities

Source device: UICC

Destination device: ME

File list

Number of files: 2

File: EF IMSI

File: EF 5GS3GPPLOCI

Coding:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BER-TLV: | D0 | 1A | 81 | 03 | 01 | 01 | 06 | 82 | 02 | 81 | 82 | 92 |
|  | 0F | 02 | 3F | 00 | 7F | FF | 6F | 07 | 3F | 00 | 7F | FF |
|  | 5F | C0 | 4F | 01 |  |  |  |  |  |  |  |  |

PROACTIVE COMMAND: REFRESH 6.2.2

Logically:

Command details

Command number: 1

Command type: REFRESH

Command qualifier: 3G Session Reset

Device identities

Source device: UICC

Destination device: ME

File list

Number of files: 2

File: EF IMSI

File: EF 5GS3GPPLOCI

Refresh enforcement policy: Force immediate REFRESH even if the terminal is busy on data call

Coding:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BER-TLV: | D0 | 1D | 81 | 03 | 01 | 01 | 06 | 82 | 02 | 81 | 82 | 92 |
|  | 0F | 02 | 3F | 00 | 7F | FF | 6F | 07 | 3F | 00 | 7F | FF |
|  | 5F | C0 | 4F | 01 | 3A | 01 | 02 |  |  |  |  |  |

TERMINAL RESPONSE: REFRESH 6.2.1A

Logically:

Command details

Command number: 1

Command type: REFRESH

Command qualifier: 3G Session Reset

Device identities

Source device: ME

Destination device: UICC

Result

General Result: Command performed successfully

Coding:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BER-TLV: | 81 | 03 | 01 | 01 | 06 | 82 | 02 | 82 | 81 | 83 | 01 | 00 |

TERMINAL RESPONSE: REFRESH 6.2.1B

Logically:

Command details

Command number: 1

Command type: REFRESH

Command qualifier: 3G Session Reset

Device identities

Source device: ME

Destination device: UICC

Result

General Result: REFRESH performed with additional EFs read

Coding:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BER-TLV: | 81 | 03 | 01 | 01 | 06 | 82 | 02 | 82 | 81 | 83 | 01 | 03 |

Expected Sequence 6.X (REFRESH, USIM Application Reset for IMSI Changing procedure, NG-RAN)

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Direction | MESSAGE / Action | Comments |
| 1 | ME → NG-SS | ME successfully REGISTER with NG-RAN cell. |  |
| 2 | UICC→ ME | PROACTIVE COMMAND PENDING: REFRESH 6.X.1 | [To inform the ME that IMSI has changed] |
| 3 | ME → UICC | FETCH |  |
| 4 | UICC → ME | PROACTIVE COMMAND: REFRESH 6.X.1 |  |
| 5 | ME→NG-SS | Deregistration Request |  |
| 6 | ME → UICC | STATUS[P1='02'] | ME indicates to USIM that the termination procedure is starting |
| 7 | ME → UICC | Select AID=USIM  (P2='44') OR (P2='4C') | Application termination |
| 8 | UICC | Update EF IMSI and EF 5GS3GPPLOCI. | The content of EFIMSI has been updated to "246813579" and 5G-GUTI in EF5GS3GPPLOCI is updated to 'FF FF FF FF FF FF FF FF FF FF FF FF FF' |
| 9 | ME → UICC | USIM Initialization, including send STATUS[P1='01'] | [ME performs USIM initialization] |
| 10 | ME → UICC | TERMINAL RESPONSE: REFRESH 6.X.1 | [normal ending] |
| 11 | UICC → ME | PROACTIVE UICC SESSION ENDED |  |
| 12 | ME→NG-SS | Registration Request | The ME will register using IMSI "246813579" in NG-RAN. |
| 13 | NG-SS→ME | Registration Accept |  |
| 14 | ME→NG-SS | Registration Complete |  |

PROACTIVE COMMAND: REFRESH 6.X.1

Logically:

Command details

Command number: 1

Command type: REFRESH

Command qualifier: USIM Application Reset

Device identities

Source device: UICC

Destination device: ME

Coding:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BER-TLV: | D0 | 09 | 81 | 03 | 01 | 01 | 05 | 82 | 02 | 81 | 82 |  |

TERMINAL RESPONSE: REFRESH 6.X.1

Logically:

Command details

Command number: 1

Command type: REFRESH

Command qualifier: USIM Application Reset

Device identities

Source device: ME

Destination device: UICC

Result

General Result: Command performed successfully

Coding:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| BER-TLV: | 81 | 03 | 01 | 01 | 05 | 82 | 02 | 82 | 81 | 83 | 01 | 00 |

27.22.4.7.6.5 Test requirement

The ME shall operate in the manner defined in expected sequences 6.1 to 6.X.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*end of changes \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*