
25 Tests of the layer 2 signalling functions

References:

- 1 ETSI ETS 300 555 (GSM 04.06) and ETS 300 557 (GSM 04.08), GSM 04.05.
- 2 CCITT Rec. X.290: OSI Conformance Testing Methodology and Framework for CCITT applications, Part 2: Abstract Test Suite Specification.

25.1 Introduction, objective and scope

25.1.1 General

The objective of section 25 is to provide detail of how Layer 2 of the MS is tested to verify conformance to the testable parameters given in GSM 04.06. The tests cover SAPI = 0, and they will be carried out on SDCCH and FACCH/F and on FACCH/H if the MS supports half-rate. Testing of unnumbered information transfer on SACCHs is covered implicitly by the test in section 26.6.3.

The testing is performed using the test configuration described in section 25.1.1.2. This configuration does not provide for testing of conformance of any maintenance functions.

The MS under test shall conform to the test configuration, and the Remote Single layer (RS) test method (CCITT X.290, section 8.1.4) will be used.

25.1.2 Test configurations

The Layer 2 test configuration defines the Layer 2 functional blocks of a MS being tested and the access arrangement between MS and tester.

NOTE: These functional blocks provide the Layer 2 basic capabilities which have to be implemented in accordance with the specification given in GSM 04.06. However, the definition of Layer 2 in the form of a number of functional blocks places no requirements on the Layer 2 implementation in a MS.

An example of a functional composition of the MS Layer 2 is given in GSM 04.05. These function blocks provide basic capabilities which have to be implemented in accordance with GSM 04.05 and GSM 04.06.

Also there are alternatives or options included in GSM 04.05 and GSM 04.06, these are provided as complementary capabilities.

25.1.3 Pre-conditions

Before carrying out any Layer 2 tests the tests specified in section 12, 13, 14 and 15 to 23 (Layer 1 tests) shall be performed.

Apart from powering up the MS to be tested and being able to establish a call the only access to the MS needed and used for Layer 2 testing is the radio interface. It therefore is necessary that the MS is able to synchronize to the System Simulator and to decode its BCCH and CCCH. Furthermore, the MS must be able to perform the following elementary Layer 3 procedures:

- Paging
- Immediate Assignment
- Dedicated Channel Assignment
- Handover
- Channel Release.

It is necessary that the tests are performed in the order specified, except where the starting point is set (25.1.5).

The data link is maintained by the MS and the SS sending fill frames (c.f. GSM 04.06, sect. 5.4.2.3) on the SDCCH when no other frames are to be transmitted. Fill frames are also sent on the FACCH while the channel mode is set to signalling. The default mode is signalling. The tests will normally be performed with the MS sending fill frames on the main DCCH (i.e. FACCH or SDCCH). Consequently throughout the tests fill frames will be sent and received even while waiting for other Layer 2 frames. The scheduling of the fill frame sending cannot be specified as this sending is closely linked to the processing times in the MS. Therefore, the instants of transmission of fill frames cannot be tested nor the number of these transmissions however, in certain circumstances, the fact that a fill frame is sent can be used as proof that the MS requirement has been fulfilled.

25.1.4 Layer 2 test frames

The Layer 2 conformance test is accomplished by sequences of those frames which are contained in GSM 04.06 (Layer 2 frame repertoire etc.).

These frame sequences are under control of the System Simulator and are related to the state that the System Simulator perceives the MS to be in as a result of frames transferred across the MS-BS interface.

These frame sequences shall comply with the following rules:

- 1) The test sequences exchanged between the System Simulator and MS are assumed to be free from transmission errors.
- 2) The tester may introduce errors in the direction tester to MS by inserting wrong parameters in the address, control and length indication field.
- 3) The tester may simulate errors in the direction MS to tester by ignoring the receipt of frames from the MS.
- 4) The tester may violate the protocol rules related to the control of state variables to provoke sequence gaps.
- 5) There is no contention on the Dm channel at Layer 1 (Layer 1 point-to-point).
- 6) With respect to contention on the Dm channel at Layer 2, two distinct situations are defined:
 - i) Test of the protocol procedure supported by a single entity. In this case there is no contention on the Dm channel (one peer-to-peer information transfer invoked at a time). This test applies to all MSs and is performed for SAPI = 0.
 - ii) Test of Layer 2 multiplexing and MS processing capacity in terms of the number of SAPs and links which a MS is able to support simultaneously. In this case there is contention on the Dm channel at Layer 2 and this contention is resolved within Layer 2 based on the SAPI. This test applies to MSs which are designed for supporting SAPI in addition to SAPI = 0.

Examples of special GSM Layer 2 functions to be tested:

- Correct L2 functions on specific GSM control channels;
- Length indication;
- Fill bits;
- Segmentation, more data bit;
- SABM/UA containing information for contention resolution;
- Abnormal release.

25.1.5 Establishment of the dedicated physical resource

The System Simulator shall simulate a BS with BCCH/CCCH on one carrier. The MS shall be listening to this CCCH and able to respond to paging messages. The system simulator sends Paging Request to the MS on the paging channel. The MS shall respond with Channel Request on the random access channel. The system simulator sends Immediate Assign to the MS, thereby ordering the MS either to a SDCCH or to a TCH, that is FACCH. Each test is performed once on SDCCH, once on FACCH/F and once on FACCH/H if the MS supports half-rate. However tests that explicitly check SDCCH and FACCH are performed once if the MS does not support half-rate and twice (once with FACCH/F and once with FACCH/H) if the MS supports half-rate.

25.1.6 Release of the dedicated physical resource

After a test has been performed the System Simulator shall initiate the release of the SDCCH or FACCH, as laid out in GSM 04.08, section 7.1.6. This shall return the MS to the idle mode, i.e. the MS shall again be listening to the CCCH of the System Simulator.

25.2 Test sequences

Timing requirement:

The MS shall respond to a command within T200 as defined in GSM 04.06.

The MS shall repeat a command after time-out of T200 if the command has not been acknowledged as defined in GSM 04.06.

Constant bit values:

In each frame from the MS:

- bits 6 through 8 of the address field shall be set to zero as defined in GSM 04.06.
- except for test 25.2.7, the address extension bit (EA bit) shall be set to 1 as defined in GSM 04.06.
- except for test 25.2.7, the length indicator field extension bit (EL bit) shall be set to 1 as defined in GSM 04.06.

This shall be checked each time a frame from the MS is received.

Fill bits:

The fill bits transmitted with each frame from the MS whose length indicator L is less than N201 as defined in GSM 04.06 shall be set as defined in GSM 04.06.

Frame format description

The frames are described by the following parameter sets:

SABM (C, P, M = 0, L = 0) (* SABM without an information field*)

SABM (C, P, M = 0, L > 0) (* SABM with an information field*)

DISC (C, P, M = 0, L = 0)

UA, (F, M = 0, L = 0) (* UA without an information field*)

UA, (F, M = 0, L > 0) (* UA with an information field*)

DM (R, F, M = 0, L = 0)

RR (C, P, M = 0, L = 0, N(R))

RR (R, F, M = 0, L = 0, N(R))

REJ (C, P, M = 0, L = 0, N(R))

REJ (R, F, M = 0, L = 0, N(R))

I (C, P, M = 0, L < N201, N(S), N(R))

I (C, P, M = 1, L = N201, N(S), N(R))

UI (C, P = 0, M = 0, L = 0)

UI (C, P = 0, M = 0, L < N201)

where:

C = command

R = response

P = poll

F = final

M = M bit

L = length indicator

N(S) = send sequence number

N(R) = receive sequence number.

25.2.1 Initialization

25.2.1.1 Initialization when contention resolution required

25.2.1.1.1 Normal initialization

25.2.1.1.1.1 Test purpose

To test the normal establishment of multiple frame operation between the SS and the MS when contention resolution is required.

25.2.1.1.1.2 Method of test

The MS is paged as described in the Layer 2 tests general section at 25.1.5.

The MS shall then continue the setup by sending a SABM frame.

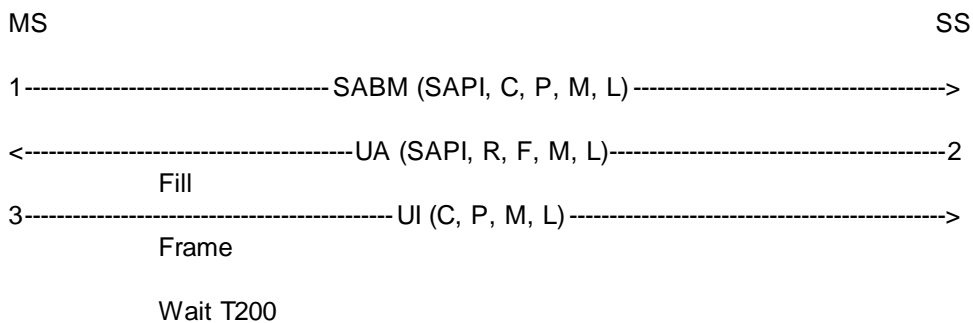
The SS responds with a UA frame.

The MS shall send a UI fill frame.

The SS waits for at least T200 after the UA to ensure the SABM frame is not repeated. This confirms that the UA has been received.

The MS is returned to the idle state as described in 25.1.1.6.

Expected sequence



The frames from the SS will be:

2: One UA frame containing:

SAPI = 0, R = 0, F = 1, M = 0, L = L of SABM
information field = information field of SABM

25.2.1.1.1.3 Test requirements

The frames from the MS shall be:

1: One SABM frame containing:

SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201
information field = Page Response

3: One UI frame containing:

C = 0, P = 0, M = 0, L = 0

25.2.1.1.2 Initialization failure

25.2.1.1.2.1 Loss of UA frame

25.2.1.1.2.1.1 Test purpose

To test the MS response to the loss of a Layer 2 UA frame during initialization.

25.2.1.1.2.1.2 Method of test

The MS is paged as described in the Layer 2 tests general section at 25.1.5.

The MS shall then continue the setup by sending an SABM frame.

The SS ignores the first SABM frame from the MS.

The MS shall wait for time-out of timer T200 and then send a second SABM frame.

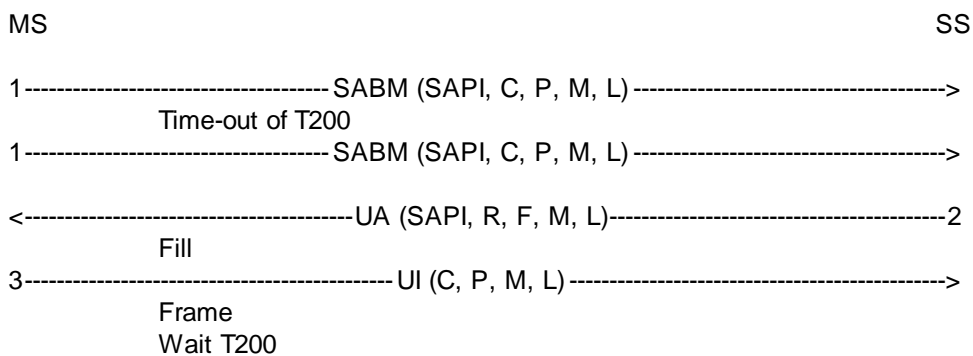
The SS responds with a UA frame.

The MS shall send a UI fill frame.

The SS waits for at least T200 to ensure the SABM frame is not repeated

The MS is returned to the initial condition by clearing of the call (not part of this test).

Expected sequence



The frames from the SS will be:

2: One UA frame containing:

SAPI = 0, R = 0, F = 1, M = 0, L = L of SABM
information field = information field of SABM

25.2.1.1.2.1.3 Test requirements

The frames from the MS shall be:

1: One SABM frame (occurs twice) containing:

SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201
information field = Page Response

The second SABM frame shall follow the first SABM frame after
time-out of timer T200.

3: One UI frame containing:

C = 0, P = 0, M = 0, L = 0

25.2.1.1.2.2 UA frame with different information field

25.2.1.1.2.2.1 Test purpose

To test that the MS will leave the channel and return to the idle state when multiple frame establishment fails because a UA frame with a different information field is received in response to the SABM frame.

To test that the MS will thereafter repeat the immediate assignment procedure returning to the idle state when multiple frame establishment fails because a UA frame with a different information field is received in response to the SABM frame.

To test that MS will not attempt to perform the immediate assignment procedure after the first repetition.

25.2.1.1.2.2.2 Method of test

The MS is paged as described in the general section for Layer 2 testing in section 25.1.5. The MS is now in a condition to test the Layer 2 aspects of multiple frame establishment with contention resolution and a UA frame with an information field different from the one in its SABM frame.

The MS shall send an SABM frame.

The SS shall respond with an UA frame whose information field is different from the one in the SABM frame.

The MS shall send an SABM frame.

The SS shall respond with an UA frame whose information field is different from the one in the SABM frame.

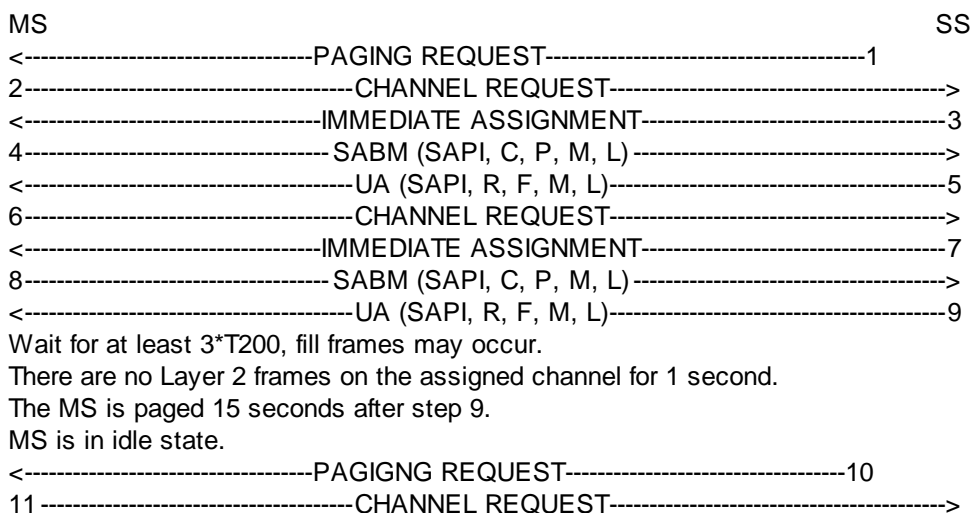
The SS shall wait for 3*T200 to check that the MS does not send any L2 frames other than L2 fill frames on the assigned channel.

After a time equal to 3*T200 the SS checks that there are no more Layer 2 frames on the assigned channel, for a period of 1 second.

NOTE 1: Possible fill frames are allowed in order to take into account processing time inside the MS.

NOTE 2: There are no further attempts of immediate assignment procedure after the repetition.

15 seconds after sending the UA frame in response to the repetition of the immediate assignment procedure the SS pages the MS according to 25.2.1.1.1, to make sure that the MS has returned to the idle state.



The frames from the SS will be:

5,9: Two UA frames containing:

SAPI = 0, R = 0, F = 1, M = 0, L = 0

25.2.1.1.2.2.3 Test requirements

The frames from the MS shall be:

4,8: Two SABM frames containing:

SAPI = 0, C = 0, P = 1, M = 0, 0 < L <= N201

information field = Page Response

25.2.1.1.2.3 Information frame and supervisory frames in response to an SABM frame

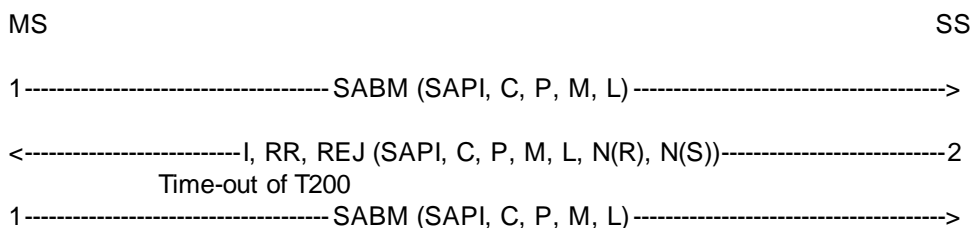
25.2.1.1.2.3.1 Test purpose

To test that the MS will ignore receipt of frames other than a UA when received in response to the SABM frame.

25.2.1.1.2.3.2 Method of test

As in 25.2.1.1.2.2, but instead of returning a UA frame the SS will respond with an I frame, RR frame, REJ frame. (So this test will actually be performed 3 times.). The MS shall ignore receipt of the frames sent by the SS and therefore resend its SABM frame after time-out of T200.

Expected Sequence



The frames from the SS will be:

2: One I frame containing:

SAPI = 0, C = 1, P = 1, M = 0, 0 <= L <= N201 (arbitrary), N(R), N(S) arbitrary
information field arbitrary

or One RR frame containing:

SAPI = 0, C = 1, P = 1, N(R) arbitrary

or One REJ frame containing:

SAPI = 0, C = 1, P = 1, N(R) arbitrary

25.2.1.1.2.3.3 Test requirements

The frames from the MS shall be:

1: One SABM frame (occurs twice) containing:

SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201
information field = Page Response

The second SABM frame shall follow the first SABM frame after time-out of timer T200.

25.2.1.1.3 Initialization denial

25.2.1.1.3.1 Test purpose

To test that the MS takes appropriate action if the network side indicates that it can not enter the multiple frame established state.

25.2.1.1.3.2 Method of test

The MS is paged as described in the Layer 2 tests general section at 25.1.5.

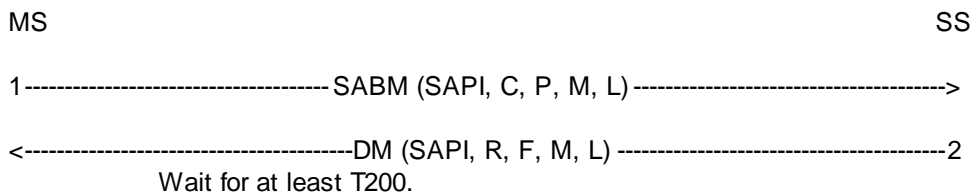
The MS shall then continue the setup by sending a SABM frame.

The SS responds with a DM frame.

The SS then waits at least T200 for the MS to transmit.

The MS shall not repeat the SABM frame.

Expected Sequence



The frames from the SS will be:

2: One DM frame containing:

SAPI = 0, R = 0, F = 1, M = 0, L = 0

25.2.1.1.3.3 Test requirements

The frames from the MS shall be:

1: One SABM frame containing:

SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201

information field = Page Response

25.2.1.1.4 Total initialization failure

25.2.1.1.4.1 Test purpose

To test the MS response to the lack of the system to respond to requests to initialize the data link.

25.2.1.1.4.2 Method of test

The MS is paged as described in the Layer 2 tests general section at 25.1.5.

The MS shall then continue the setup by sending a SABM frame.

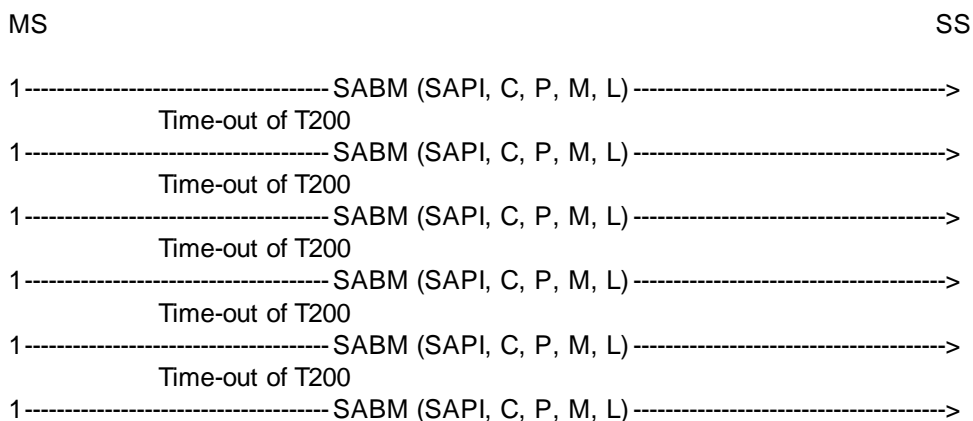
The SS ignores the first SABM frame from the MS.

The MS shall wait for time-out of timer T200 and then send a second SABM frame.

This is repeated until the MS has sent the SABM frame six times. The MS shall not send the SABM any more than six times.

The SS continues to send paging messages on the BCCH/CCCH and the test continues as in test 25.2.1.1.1.

Expected Sequence



25.2.1.1.4.3 Test requirements

The frames from the MS shall be:

1: One SABM frame (occurs six times) containing:

SAPI = 0, C = 0, P = 1, M = 0, <= L <= N201

information field = Page Response

The subsequent SABM frames shall follow the previous SABM frame after time-out of timer T200.

25.2.1.2 Initialization, contention resolution not required

This procedure is used after a data link has been established with contention resolution and a new data link is established on a new channel e.g. handover, dedicated channel assignment.

25.2.1.2.1 Normal initialization without contention resolution

25.2.1.2.1.1 Test purpose

To test the normal initialization of multiple-frame operation when contention resolution is not required.

25.2.1.2.1.2 Method of test

The data link is setup between the MS and the SS as in test 25.2.1.1.1.

After the MS has sent the UI frame the SS initiates the dedicated channel assignment procedure to assign an SDCCH.

The MS shall then continue the setup by sending a SABM frame without contention resolution.

The SS responds with a UA frame.

The MS shall then send an I frame containing the assignment complete message.

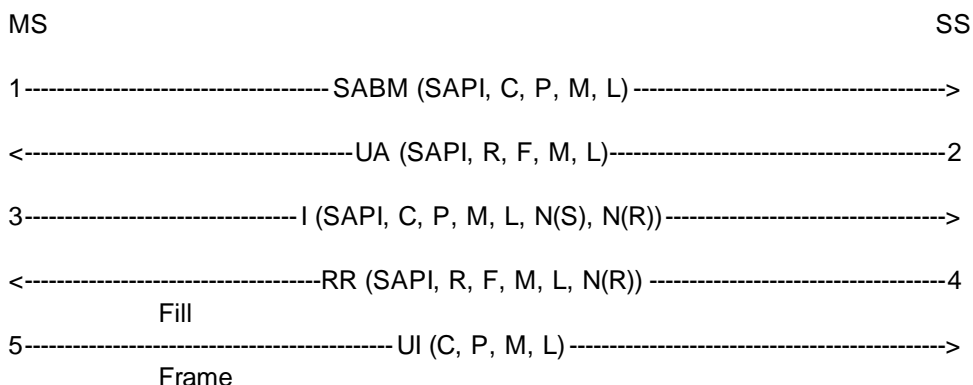
The SS shall acknowledge the I frame with an RR frame.

The SS then waits for the MS to send a UI fill frame.

The SS then initiates the dedicated channel assignment procedure to assign an FACCH.

The expected sequence is then repeated. The SS waits for at least T200 to ensure that the SABM is not repeated.

Expected Sequence



The frames from the SS will be:

2: One UA frame containing:

SAPI = 0, R = 0, F = 1, M = 0, L = 0

4: One RR frame containing:

SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1

25.2.1.2.1.3 Test requirements

The frames from the MS shall be:

1: One SABM frame containing:

SAPI = 0, C = 0, P = 1, M = 0, L = 0

3: One I frame containing:

SAPI = 0, C = 0, P = 0, M = 0, 0 <= L <= N201, N(S) = 0, N(R) = 0

Information field = Assignment Complete

5 One UI frame containing:

C = 0, P = 0, M = 0, L = 0

25.2.1.2.2 Initialization failure

25.2.1.2.2.1 Test purpose

To test the MS response to the loss of a Layer 2 UA frame during initialization.

25.2.1.2.2.2 Method of test

The SS initiates the dedicated channel assignment procedure to assign an SDCCH.

The MS shall then continue the setup by sending a SABM frame.

The SS ignores the first SABM frame from the MS.

The MS shall wait for time-out of timer T200 and then send a second SABM frame.

The SS responds with a UA frame.

The MS shall then send an I frame containing the assignment complete message.

The SS shall acknowledge the I frame with an RR frame.

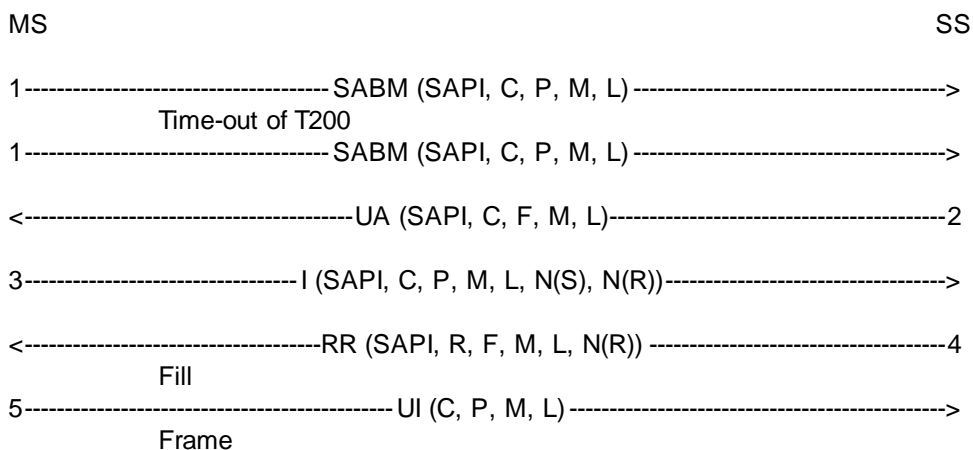
The SS then waits for the MS to send a UI fill frame.

The SS then initiates the dedicated channel assignment procedure to assign a FACCH.

The expected sequence is then repeated. The SS waits for at least T200 to ensure that the SABM is not repeated.

The MS is returned to the idle state as described in 25.1.1.6.

Expected Sequence



The frames from the SS will be:

2: One UA frame containing:

SAPI = 0, R = 0, F = 1, M = 0, L = 0

4: One RR frame containing:

SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1

25.2.1.2.2.3 Test requirements

The frames from the MS shall be:

1: One SABM frame (occurs twice) containing:

SAPI = 0, C = 0, P = 1, M = 0, L = 0

The second SABM frame shall follow the first SABM frame after time-out of timer T200.

3: One I frame containing:

SAPI = 0, C = 0, P = 0, M = 0, 0 <= L <= N201, N(S) = 0, N(R) = 0

Information field = Assignment Complete

5: One UI frame containing:

C = 0, P = 0, M = 0, L = 0

25.2.1.2.3 Initialization denial

25.2.1.2.3.1 Test purpose

To test that the MS takes appropriate action if the data link can not be initialized if the network side indicates the Layer 3 process is busy.

25.2.1.2.3.2 Method of test

The data link is setup between the MS and the SS as in test 25.2.1.1.1.

After the MS has sent the UI frame the SS initiates the dedicated channel assignment procedure to assign a SDCCH.

The MS shall then continue the setup by sending a SABM frame.

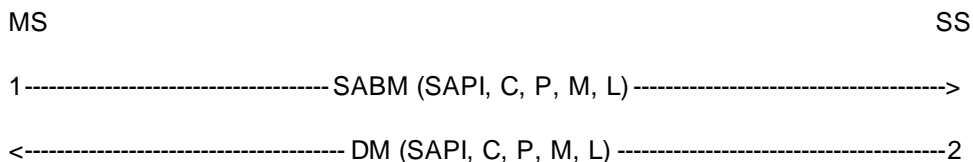
The SS responds with a DM frame.

The SS then waits at least T200.

The MS shall not repeat the SABM frame. However the MS will attempt to re-establish the link on the previous channel.

The test is repeated, but a FACCH is assigned in place of the SDCCH.

Expected Sequence



The frames from the SS will be:

2: One DM frame containing:

SAPI = 0, R = 0, F = 1, M = 0, L = 0

25.2.1.2.3.3 Test requirements

The frames from the MS shall be:

1: One SABM frame containing:

SAPI = 0, C = 0, P = 1, M = 0, L = 0

25.2.1.2.4 Total initialization failure

25.2.1.2.4.1 Test purpose

To test the MS response to the lack of the system to respond to requests to initialize the data link.

25.2.1.2.4.2 Method of test

The data link is setup between the MS and the SS as in test 25.2.1.1.1.

After the MS has sent the UI frame the SS initiates the dedicated channel assignment procedure to assign a SDCCH.

The MS shall then continue the setup by sending a SABM frame.

The SS ignores the first SABM frame from the MS.

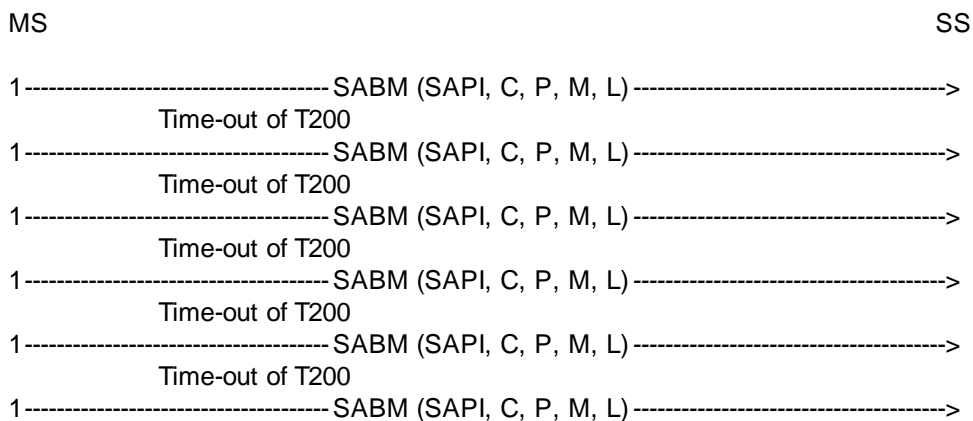
The MS shall wait for time-out of timer T200 and then send a second SABM frame.

This is repeated until the MS has sent the SABM frame six times.

The MS shall not send the SABM any more than six times.

The test is repeated, but a FACCH is assigned in place of the SDCCH.

Expected Sequence



25.2.1.2.4.3 Test requirements

The frames from the MS shall be:

1: One SABM frame (occurs six times) containing:

SAPI = 0, C = 0, P = 1, M = 0, L = 0

The subsequent SABM frames shall follow the previous SABM frame after time-out of timer T200.

25.2.2 Normal information transfer

25.2.2.1 Sequence counting and I frame acknowledgements

25.2.2.1.1 Test purpose

To test the operation of Layer 2 sequence numbering. Since there are 8 sequence numbers the test cycles through 9 information frame transfers.

25.2.2.1.2 Method of test

The MS is brought into the multiple frame established state as described in test 25.2.1.1.1.

The SS sends an Identity Request message asking for IMEI to the MS.

The MS shall acknowledge this I frame with an Identity Response I frame or a RR frame.

This is repeated a further 8 times as rapidly as possible assuming a window size 1.

The MS Layer 3 response time should be less than 4*T200 and therefore the MS responses to at least the 5th, 6th, 7th, 8th and 9th I frames must be an I frame on the SDCCH. On the FACCH it is possible that all MS responses at Layer 2 will be RR frames.

The frames from the SS will be:

1,3,5,7,9,11,13,15,17: One I frame (occurs nine times) containing:

$$\text{SAPI} = 0, \text{C} = 1, \text{P} = 0, \text{M} = 0, 0 \leq \text{L} \leq \text{N201}$$

$$\text{N(S)} = 0, 1, 2, 3 \dots 7, 0$$

$$\text{N(R)} = (\text{number of I frames received in the test sequence hitherto}) \bmod 8$$

information field = Identity Request (IMEI)

19, 21, and so on, until the SS has received 9 I frames from the MS: One RR frame containing:

$$\text{SAPI} = 0, \text{R} = 0, \text{F} = 0, \text{M} = 0, \text{L} = 0$$

$$\text{N(R)} = (\text{number of I frames received in the test sequence hitherto}) \bmod 8$$

25.2.2.1.3 Test requirements

There shall be an integer $k \geq 0$ such that for $i = 1, 2, \dots, k + 9$ the following conditions (a) and (b) both hold:

(a) The MS sends 9 I frames and k RR frames during the test.

(b) The frames sent by the MS in step 2^*i are:

(b1) If the frame is an RR frame (occurs k times): one RR frame containing:

$$\text{SAPI} = 0, \text{R} = 1, \text{F} = 0, \text{M} = 0, \text{L} = 0$$

$$\text{N(R)} = ((\text{Value of N(S) in the last received I frame from the SS}) + 1) \bmod 8$$

(b2) If the frame is an I frame (occurs 9 times): one I frame containing:

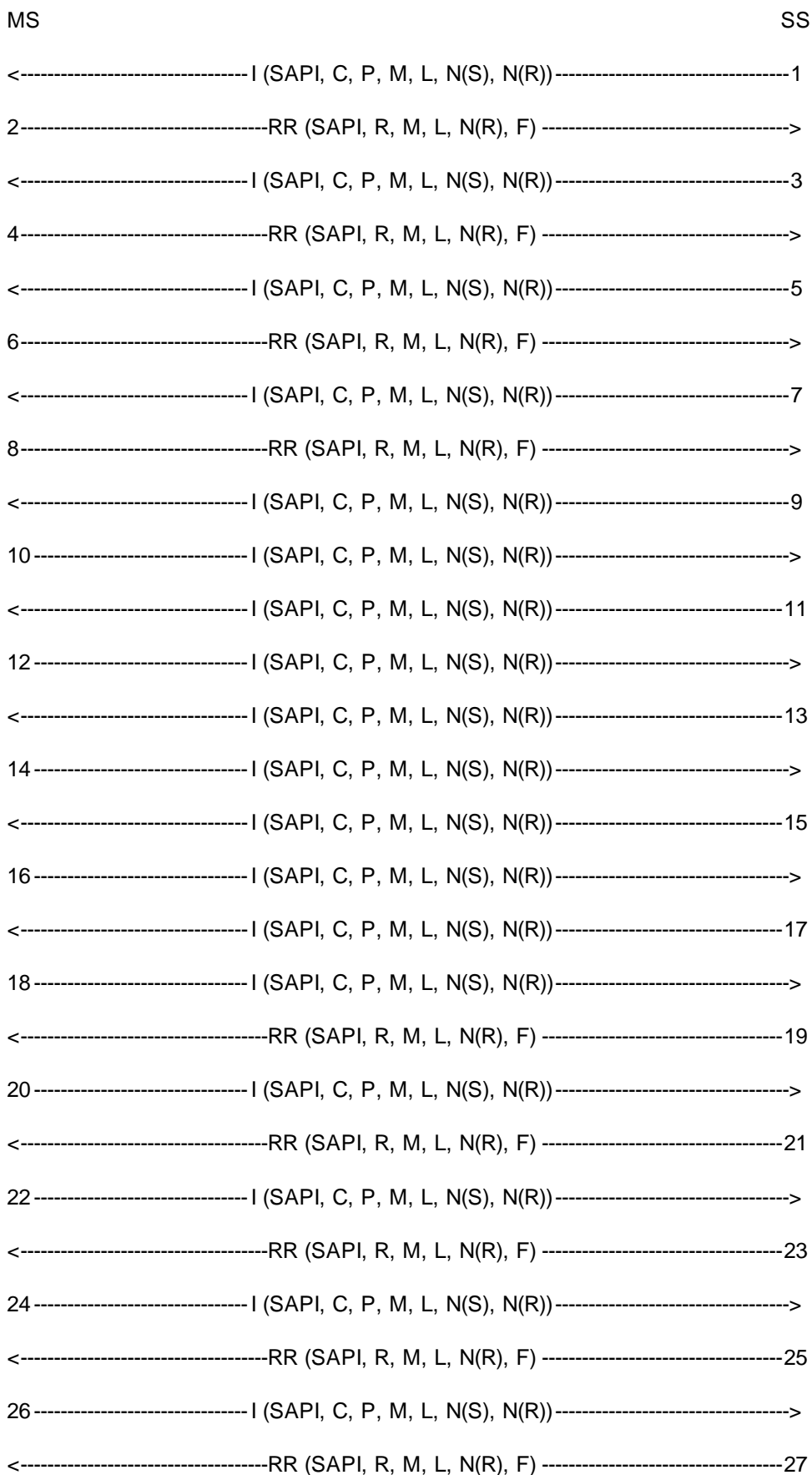
$$\text{SAPI} = 0, \text{C} = 0, \text{P} = 0, \text{M} = 0, 0 \leq \text{L} \leq \text{N201}$$

$$\text{N(R)} = ((\text{Value of N(S) in the last received I frame from the SS}) + 1) \bmod 8$$

$$\text{N(S)} = (\text{number of I frame sent hitherto by the MS to SS excluding the actual I frame}) \bmod 8$$

information field = Identity Response (IMEI)

Example of expected sequence (assuming 3xT200 < L3 reaction time < 4xT200):



The frames from the SS will be:

1, 3, 5, 7, 9, 11, 13, 15, 17: One I frame (occurs nine times) containing:

SAPI = 0, C = 1, P = 0, M = 0, $0 \leq L \leq N201$

N(S) = 0, 1, 2, 3...7, 0

N(R) = 0, 0, 0, 0, 0, 1, 2, 3, 4

information field = Identity Request (IMEI)

19, 21, 23, 25, 27: One RR frame (occurs five times) containing:

SAPI = 0, R = 0, F = 0, M = 0, L = 0

N(R) = 5, 6, 7, 0, 1

The frames from the MS shall be:

2, 4, 6, 8: One RR frame (occurs four times) containing:

SAPI = 0, R = 1, F = 0, M = 0, L = 0

N(R) = 1, 2, 3, 4

10, 12, 14, 16, 18, 20, 22, 24, 26: One I frame (occurs nine times) containing:

SAPI = 0, C = 0, P = 0, M = 0, $0 \leq L \leq N201$

N(R) = 5, 6, 7, 0, 1, 1, 1, 1, 1

N(S) = 0, 1, 2, 3, 4, 5, 6, 7, 0

information field = Identity Response (IMEI)

25.2.2.2 Receipt of an I frame in the timer recovery state

25.2.2.2.1 Test purpose

To test that the MS is able to respond to I frames whilst in the timer recovery state.

25.2.2.2.2 Method of test

The MS is brought into the multiple frame established state as described in test 25.2.1.1.1.

The SS sends an Identity Request message asking for IMEI to the MS.

The MS shall respond with a RR frame though this may be incorporated with the Identity Response I frame.

The SS does not respond to the I frame.

The MS shall wait for expiry of timer T200 and then repeat the I frame but with the P bit set to 1.

The SS then sends a valid Identity Request I frame asking for IMEI which does not acknowledge receipt of the I frame from the MS.

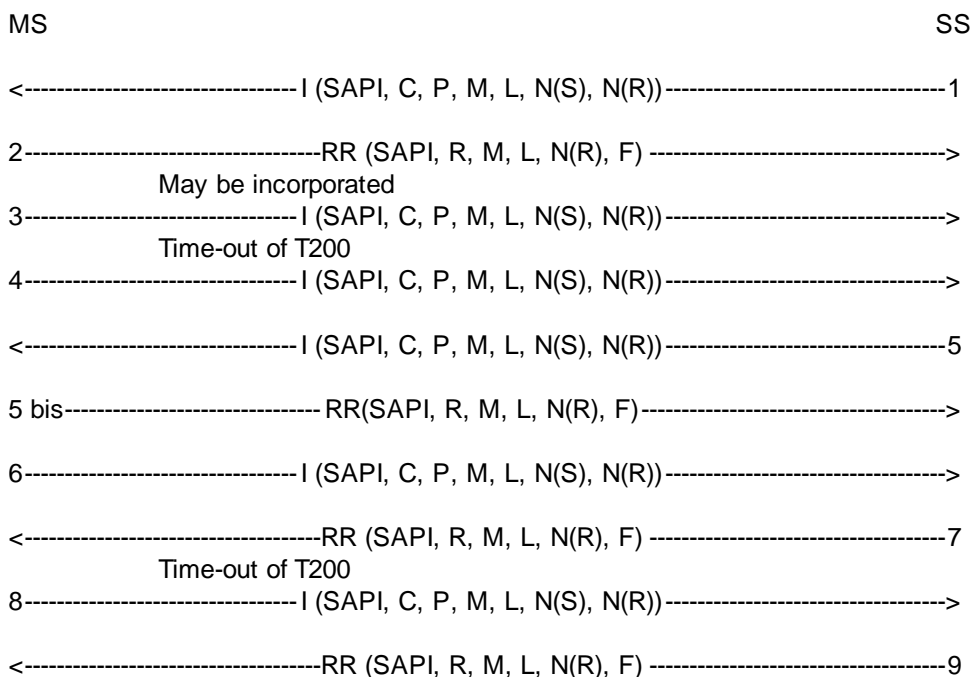
On the FACCH the MS may send an RR frame acknowledging the I frame.

The MS shall repeat the I frame, this frame will acknowledge receipt of the second I frame from the SS.

The SS then acknowledges receipt of the MS I frame by sending a RR frame.

The MS shall send the next I frame. The SS acknowledges this I frame.

Expected Sequence



The frames from the SS will be:

1, 5: One I frame (occurs twice) containing:

SAPI = 0, C = 1, P = 0, M = 0, 0 <= L <= N201, N(S) = 0, 1, N(R) = 0

information field = Identity Request

7, 9: One RR frame (occurs twice) containing:

SAPI = 0, R = 0, F = 1, 0, M = 0, L = 0, N(R) = 1, 2

25.2.2.2.3 Test requirements

The frames from the MS shall be:

2: One RR frame containing:

SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1

3, 8: One I frame (occurs twice) containing:

SAPI = 0, C = 0, P = 0, M = 0, 0 <= L <= N201, N(R) = 1, 2, N(S) = 0, 1

information field = Identity Response

4, 6: One I frame (occurs twice) containing:

SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201, N(R) = 1, 2, N(S) = 0

information field = Identity Response

5 bis: (possible only on the FACCH) One RR frame containing:

SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 2

25.2.2.3 Segmentation and concatenation

25.2.2.3.1 Test purpose

To test the proper use of segmentation and concatenation, suspend and resume.

25.2.2.3.2 Method of test

If the MS supports the UnStructuredSSData operation, then the MS is made to activate an unknown supplementary service as defined in GSM 02.30 with the following sequence *NN*s*i*#: NN is chosen to be undefined in GSM 02.30 annex 2 and is an IA5. Total length of *NN*s*i*# shall be 20 characters.

If the MS does not support the UnStructuredSSData operation, then the MS is made to initiate a call.

The SS responds with the Immediate Assign procedure firstly allocating a SDCCH and on the second repeat of the test a TCH.

The MS is brought into the multiple frame established state by continuing as described in test 25.2.1.1.1. The layer three message element in the SABM will be CM Serv Request.

The SS sends the UA and waits for 10 s. The SS then sends an I frame with CM Serv Accept.

The MS sends either:

- a REGISTER message which is segmented between two I frames;
- or
- a SETUP message.

The SS shall acknowledge only the I frame with more bit set to 1 (if any) but it shall not acknowledge the I frame with more bit set to 0.

The SS then performs a handover (in the case of SDCCH this shall be finely synchronized) while still on the assigned channel and without acknowledging the last I frame of the MS layer 3 message, making sure to fill the handover command to more than 21 octets (for example by using the cell channel description element).

On the SDCCH the MS will go into timer recovery and resend the last I frame of the layer 3 message with the P bit set to 1 when it acknowledges the two I frames of the handover command. On the FACCH the MS may simply acknowledge both I frames.

The MS does not attempt to resend the last I frame of the REGISTER or SETUP message on the old channel but instead goes to the new channel where it performs a random access using the Handover Access message and then multiple frame establishment without contention resolution as described in test 25.2.1.2.1.

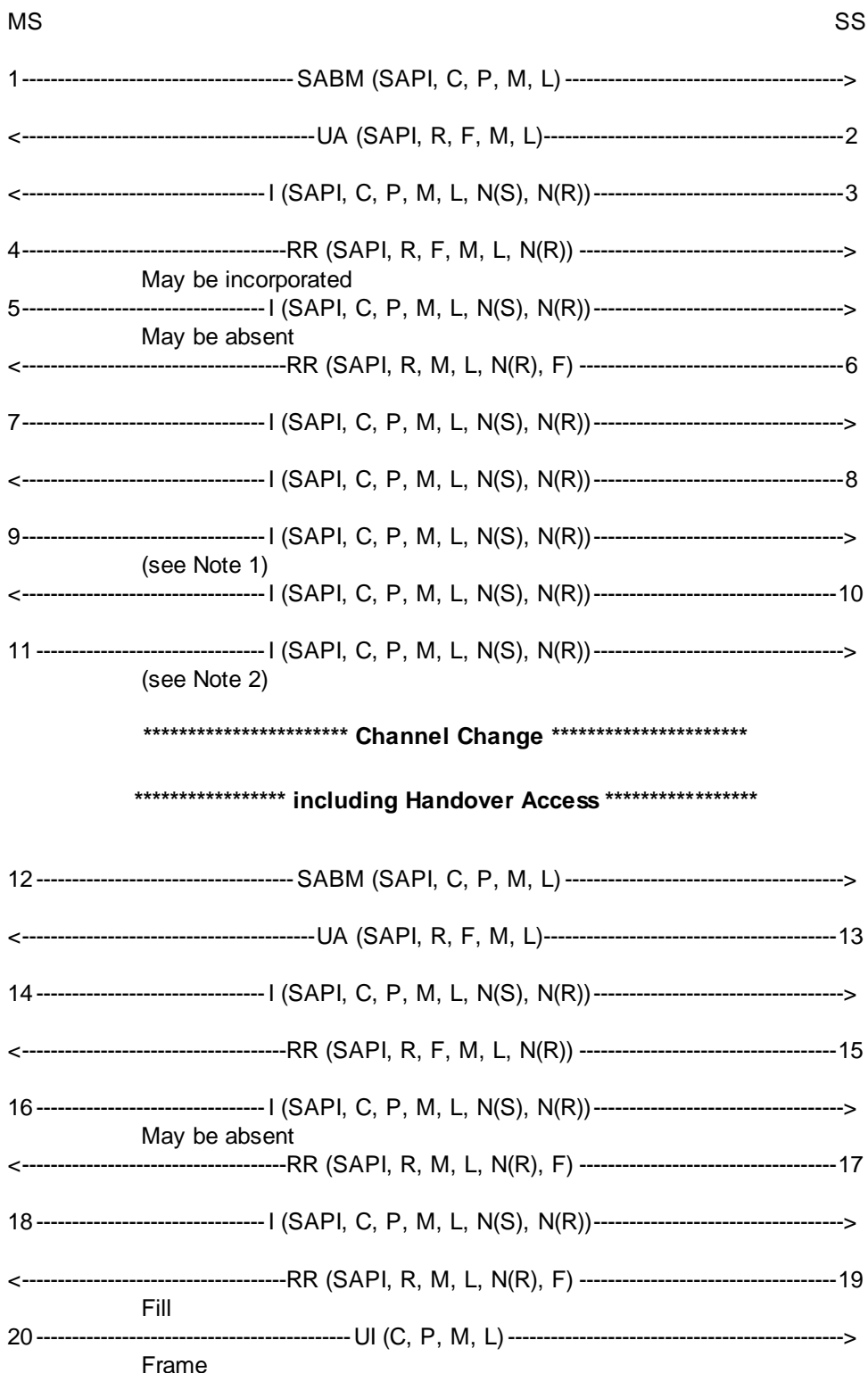
The MS shall then send an I frame with the Handover complete message. Assuming this is a finely synchronized handover.

The SS acknowledges this I frame.

The MS shall then resend the previous REGISTER or SETUP message, that is all frames which are acknowledged in the usual way.

The test has to be repeated on the FACCH.

Expected Sequence



NOTE 1: The MS may send RR frames on the FACCH in addition to the I frames in 9 and 11.

NOTE 2: The I frame in 11 is optional.

The frames from the SS will be:

2: One UA frame containing:

SAPI = 0, R = 0, F = 1, M = 0, L = L of SABM

information field = information field of SABM

3: One I frame containing:

$SAPI = 0, C = 1, P = 0, M = 0, 0 < L < N201, N(S) = 0, N(R) = 0$

information field = CM Service Accept

6: One RR frame containing: (This frame is sent only if frame 5 was received)

$SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1$

8, 10: Two I frames containing:

$SAPI = 0, C = 1, P = 0, M = 1, 0, L = N201, <= N201, N(S) = 1, 2, N(R) = 1 \text{ or } 0$

information field = Handover

13: One UA frame containing:

$SAPI = 0, R = 0, F = 1, M = 0, L = 0$

15, 17, 19: Two or three RR frames containing:

$SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1, 2 \text{ or } 1, 2, 3$

25.2.2.3.3 Test requirements

The frames from the MS shall be:

1: One SABM frame containing:

$SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201$

information field = CM Service Request

4: One RR frame containing:

$SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1$

5, 7: Two I frames containing: (The first I frame may be missing)

$SAPI = 0, C = 0, P = 0, M = 1, 0, L = N201, <= N201, N(S) = 0, 1 \text{ or } 0, N(R) = 1$

information field = Register or Setup

9, 11: Two I frames containing:

$SAPI = 0, C = 0, P = 1, M = 0, 0 < L <= N201, N(S) = 1 \text{ or } 0, N(R) = 2, 3$

information field = Register or Setup

NOTE: The I frame in 11 is optional.

12: One SABM frame containing:

$SAPI = 0, C = 0, P = 1, M = 0, L = 0$

14: One I frame containing:

$SAPI = 0, C = 0, P = 0, M = 0, 0 < L < N201, N(S) = 0, N(R) = 0$

information field = Handover Complete

16, 18: Two I frames containing: (The first I frame may be missing)

$SAPI = 0, C = 0, P = 0, M = 1, 0, L = N201, 0 < L <= N201, N(S) = 1, 2 \text{ or } 1, N(R) = 0$

information field = Register or Setup

20: UI frame containing:

C = 0, P = 0, M = 0, L = 0

25.2.3 Normal layer 2 disconnection

25.2.3.1 Test purpose

To test the normal data link disconnection sequences.

25.2.3.2 Method of test

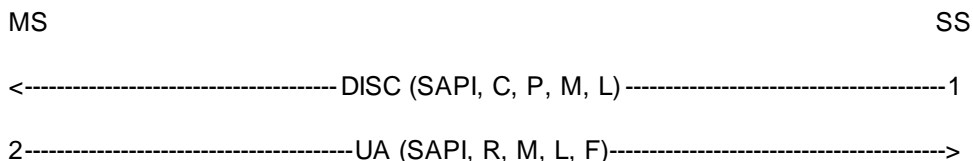
The data link is setup between the MS and the SS as in test 25.2.1.1.1.

The SS sends a Layer 2 Disconnect message to the MS.

The MS shall respond with a UA frame and return to the idle state; no more Layer 2 (I, S or U) frames, except possibly one or more "Fill" frames, shall be sent. The SS may receive "Fill" frames after the sending of the DISC frame. If this occurs this may only happen for up to T200 after the sending of the DISC frame. The checking for Layer 2 frames, and the recording of any "Fill" frames, is done for a time defined as 4 * T200.

The SS confirms that the MS has returned to the idle state by performing test 25.2.1.1.1.

Expected Sequence



The frames from the SS will be:

1: One DISC frame containing:

SAPI = 0, C = 1, P = 1, M = 0, L = 0

25.2.3.3 Test requirements

The frames from the MS shall be:

2: One UA frame containing:

SAPI = 0, R = 1, F = 1, M = 0, L = 0

No other Layer 2 (I, S or U) frames shall occur. If "Fill" frames are sent this may only be done for up to T200 after the sending of the DISC frame.

25.2.4 Test of link failure

25.2.4.1 I frame loss (MS to SS)

25.2.4.1.1 Test purpose

To test that the MS repeats an I frame N200 times with T200 between two I frames and that the MS releases the layer 2 link after N200 repetitions of the I frame in the case when no answer to the I frame is received.

25.2.4.1.2 Method of test

The MS is brought into the multiple frame established state as described in test 25.2.1.1.1.

The SS sends an Identity Request message asking for IMEI to the MS.

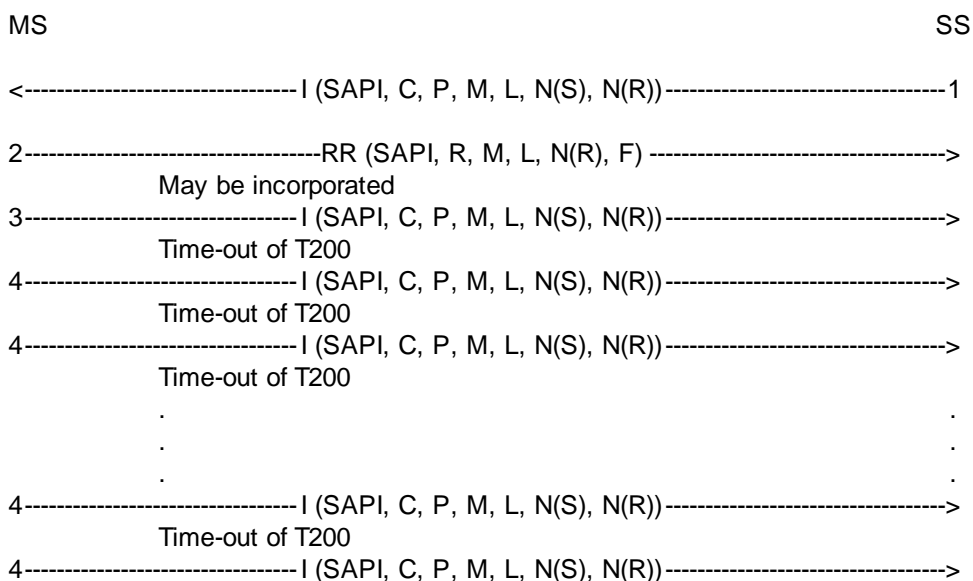
The MS shall respond with a RR frame though this may be incorporated with the Identity Response I frame.

The SS does not respond to the I frame.

The MS shall wait for expiry of timer T200 and then repeat the I frame but with the P bit set to 1.

This is repeated until the MS has sent the I frame N200+1 times. The MS shall not send any layer 2 frame. This is checked for a time of 4 * T200. The MS shall return to the idle state. This is checked by performing test 25.2.1.1.1.

Expected Sequence



The frames from the SS will be:

1: One I frame containing:

SAPI = 0, C = 1, P = 0, M = 0, 0 <= L <= N201, N(S) = 0, N(R) = 0

information field = Identity Request

25.2.4.1.3 Test requirements

The frames from the MS shall be:

2: One RR frame containing:

SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1

3: One I frame containing:

SAPI = 0, C = 0, P = 0, M = 0, 0 <= L <= N201, N(R) = 1, N(S) = 0

information field = Identity Response

4: One I frame (occurs N200 times) containing:

SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201, N(R) = 1, N(S) = 0

information field = Identity Response

25.2.4.2 RR response frame loss (SS to MS)

Covered in test 25.2.2.2.

25.2.4.3 RR response frame loss (MS to SS)

25.2.4.3.1 Test purpose

To test the Layer 2 recovery mechanism in the event of RR frame loss.

25.2.4.3.2 Method of test

The MS is brought into the multiple frame established state as described in test 25.2.1.1.1.

The SS sends a I frame containing a Layer 3 message using PD=1111 (e.g. 0FH) to the MS. The L3 message is TEST INTERFACE with tested device equal to 0.

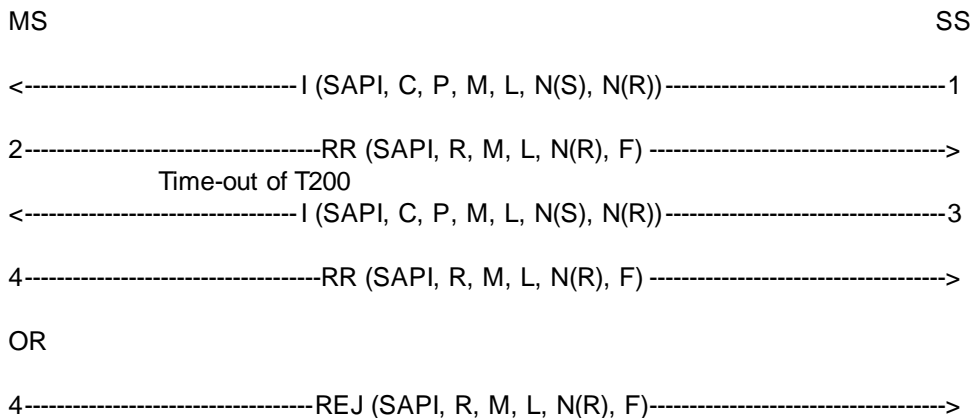
The MS shall respond with a RR frame.

The SS ignores the RR frame from the MS but after T200 from the I frame sent by the SS the SS repeats the I frame but with the P bit set to 1. This simulates loss of the RR from the MS.

The MS shall respond with either an RR or REJ frame.

NOTE: This requirement is less restrictive than GSM 04.06.

Expected Sequence



The frames from the SS will be:

1: One I frame containing:

SAPI = 0, C = 1, P = 0, M = 0, L = 3, N(S) = 0, N(R) = 0

3: One I frame containing:

SAPI = 0, C = 1, P = 1, M = 0, L = 3, N(S) = 0, N(R) = 0

25.2.4.3.3 Test requirements

The frames from the MS shall be:

2: One RR frame containing:

SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1

4: One RR frame containing:

SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 1

OR

4: One REJ frame containing:

SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 1

25.2.5 Test of frame transmission with incorrect C/R values

Purpose of tests

To test that the MS will react correctly upon the reception of a frame with incorrect C/R value.

Initial Conditions

Perform the establishment of the dedicated physical resource according to 25.1.5 and initialize the link as in 25.2.1.1.1. Then proceed as stated below.

25.2.5.1 I frame with C bit set to zero

25.2.5.1.1 Test purpose

To test that the MS will take no action when it receives an I frame with the C bit set to zero (R).

25.2.5.1.2 Method of test

The data link is set up between the MS and the SS as in test 25.2.1.1.1.

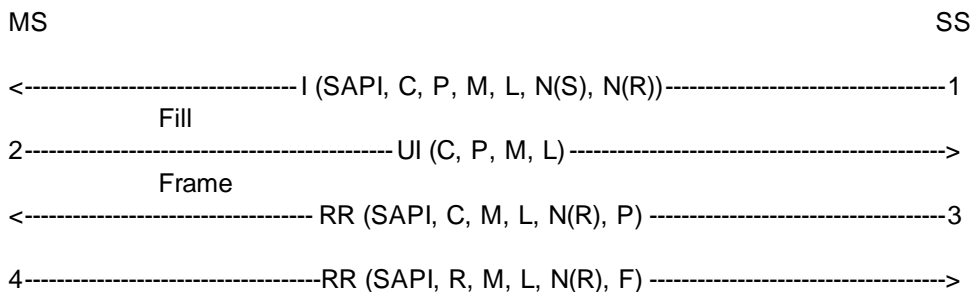
The SS shall send an I frame with the C bit set to zero to the MS.

The SS shall then wait for at least 4 times T200 to make sure that the MS does not respond to that I frame but that the MS keeps sending fill frames.

The SS shall after 4 times T200 send a RR command, P bit set to 1.

The MS shall respond with a RR response, F bit set to 1.

Expected Sequence



The frames from the SS will be:

1: One I frame containing:

SAPI = 0, C = 0, P = 1, M = 0, 0 <= L <= N201, N(R) = 0, N(S) = 0

Information field = Identity Request

3: One RR frame containing:

SAPI = 0, C = 1, P = 1, M = 0, L = 0, N(R) = 0

25.2.5.1.3 Test requirements

The frames from the MS shall be:

2: UI frames containing:

C = 0, P = 0, M = 0, L = 0

4: One RR frame containing:

SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 0

25.2.5.2 SABM frame with C bit set to zero

25.2.5.2.1 Test purpose

To test that the MS will take no action when it receives an SABM frame with the C bit set to zero (R).

25.2.5.2.2 Method of test

The MS is brought into the multiple frame established state as described in test 25.2.1.1.1.

The SS sends an I frame containing a Layer 3 message using PD=1111 (e.g. 0FH) in order to raise V(R) in the MS to 1. The L3 message is TEST INTERFACE with tested device equal to 0.

The MS shall acknowledge this by the appropriate RR frame.

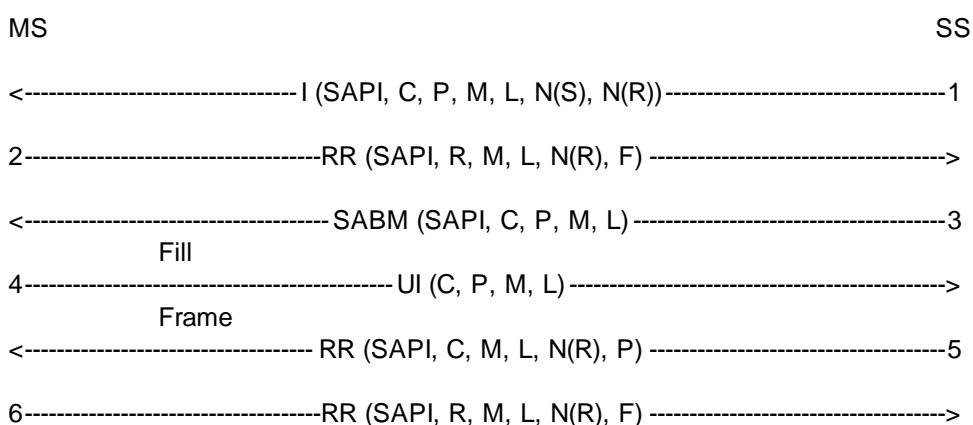
The SS sends SABM with the C bit set to zero.

The SS shall after 4 times T200 send a RR command, P bit set to 1.

The MS shall respond with a RR response, F bit set to 1.

The MS is returned to the idle state as described in 25.2.1.1.6.

Expected Sequence



The frames from the SS will be:

1: One I frame containing:

SAPI = 0, C = 1, P = 0, M = 0, L = 3, N(S) = 0, N(R) = 0

3: One SABM frame containing:

SAPI = 0, C = 0, P = 1, M = 0, L = 0

5: One RR frame containing:

SAPI = 0, C = 1, P = 1, M = 0, L = 0, N(R) = 0

25.2.5.2.3 Test requirements

The frames from the MS shall be:

2: One RR frame containing:

SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1

4: One UI frame containing:

C = 0, P = 0, M = 0, L = 0

6: One RR frame containing:

SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 1

25.2.6 Test of errors in the control field

Purpose of tests

To test that the MS will react in the proper way to errors in the Control Field.

25.2.6.1 N(S) sequence error

25.2.6.1.1 Test purpose

To test that the MS will ignore the contents of the I field of an out-of-sequence I frame from the SS.

25.2.6.1.2 Method of test

The MS is brought into the multiple frame established state as described in test 25.2.1.1.1.

The SS shall send a correct I frame containing Identity Request.

The MS shall acknowledge this in a RR frame or piggy back the acknowledgement onto the I frame carrying Identity Response.

The SS shall then send an I frame containing Identity Request with incorrect N(S) but correctly acknowledging the MS's I frame; P bit set to zero.

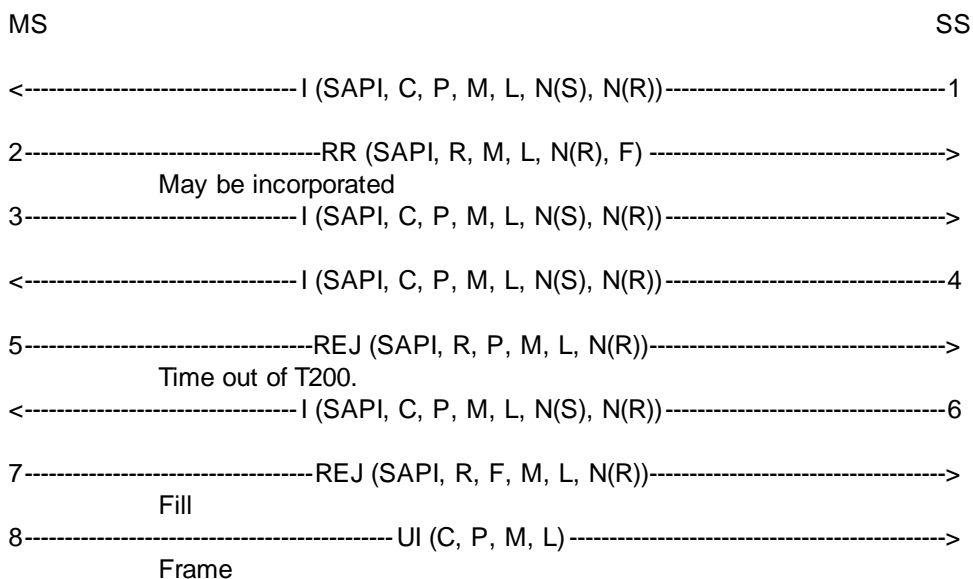
The MS shall send a REJ frame.

The SS shall, after T200, send another I frame with incorrect N(S), P bit set to 1 this time.

The MS shall respond with a REJ, F bit set to 1.

The MS shall resume the transmission of fill frames.

Expected Sequence



The frames from the SS will be:

1: One I frame containing:

$$SAPI = 0, C = 1, P = 0, M = 0, 0 \leq L \leq N201, N(S) = 0, N(R) = 0$$

information field = Identity Request

4: One I frame containing:

$$SAPI = 0, C = 1, P = 0, M = 0, 0 \leq L \leq N201, N(S) = 0, N(R) = 1$$

information field = Identity Request

6: One I frame containing:

$$SAPI = 0, C = 1, P = 1, M = 0, 0 \leq L \leq N201, N(S) = 0, N(R) = 1$$

information field = Identity Request

25.2.6.1.3 Test requirements

The frames from the MS shall be:

2: One RR frame containing:

$$SAPI = 0, R = 1, F = 0, M = 0, L = 0, N(R) = 1$$

3: One I frame containing:

$$SAPI = 0, C = 0, P = 0, M = 0, 0 \leq L \leq N201, N(R) = 1, N(S) = 0$$

information field = Identity Response

5: One REJ frame containing:

$$SAPI = 0, R = 1, P = 0, M = 0, L = 0, N(R) = 1$$

7: One REJ frame containing:

$$SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 1$$

8: One UI frame containing:

C = 0, P = 0, M = 0, L = 0

25.2.6.2 N(R) sequence error

25.2.6.2.1 Test purpose

To test that the MS will detect a N(R) sequence error and react in the proper way to it.

25.2.6.2.2 Method of test

The MS is brought into the multiple frame established state as described in test 25.2.1.1.1.

The SS shall send an I frame containing an information field of length N201 and an incorrect receive sequence number.

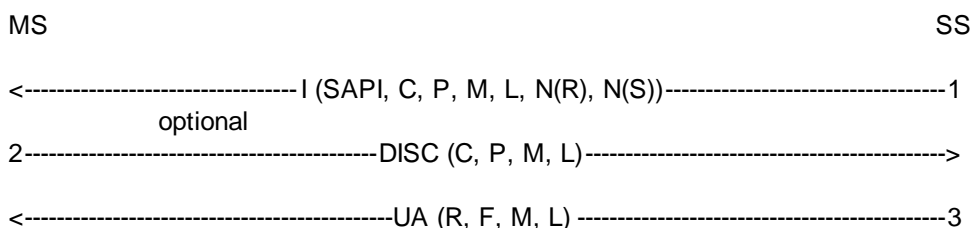
The MS may

- a) send a DISC frame within $N200 * T200$ or
- b) perform a "local end release".

In case a) the SS shall respond with a UA frame. In case b) it detects a lower layer failure.

NOTE: The delay $N200 * T200$ is specified for test purpose only. It is assumed that the L3 reaction time within the MS to command a release is less than this delay, which is less than the delay before the SS would detect a L2 failure.

Expected Sequence



The frames from the SS are:

1: One I frame:

SAPI = 0, C = 1, P = 0, M = 1, L = N201, N(R) = 1, N(S) = 0

In case a):

3: One UA frame:

SAPI = 0, R = 0, F = 1, M = 0, L = 0

25.2.6.2.3 Test requirements

The frame from the MS in case a) shall be:

2: One DISC frame:

SAPI = 0, C = 0, P = 1, M = 0, L = 0

25.2.6.3 Improper F bit

25.2.6.3.1 Test purpose

To test that the MS, being in the timer recovery state, will return to the multiple frame established state only after having received an RR response with the F bit set to 1. This test is covered in test 25.2.2.2.

25.2.7 Test on receipt of invalid frames

25.2.7.1 Test purpose

To test that the MS will ignore all invalid frames.

25.2.7.2 Method of test

The data link is set up between the MS and the SS as in test 25.2.1.1.1.

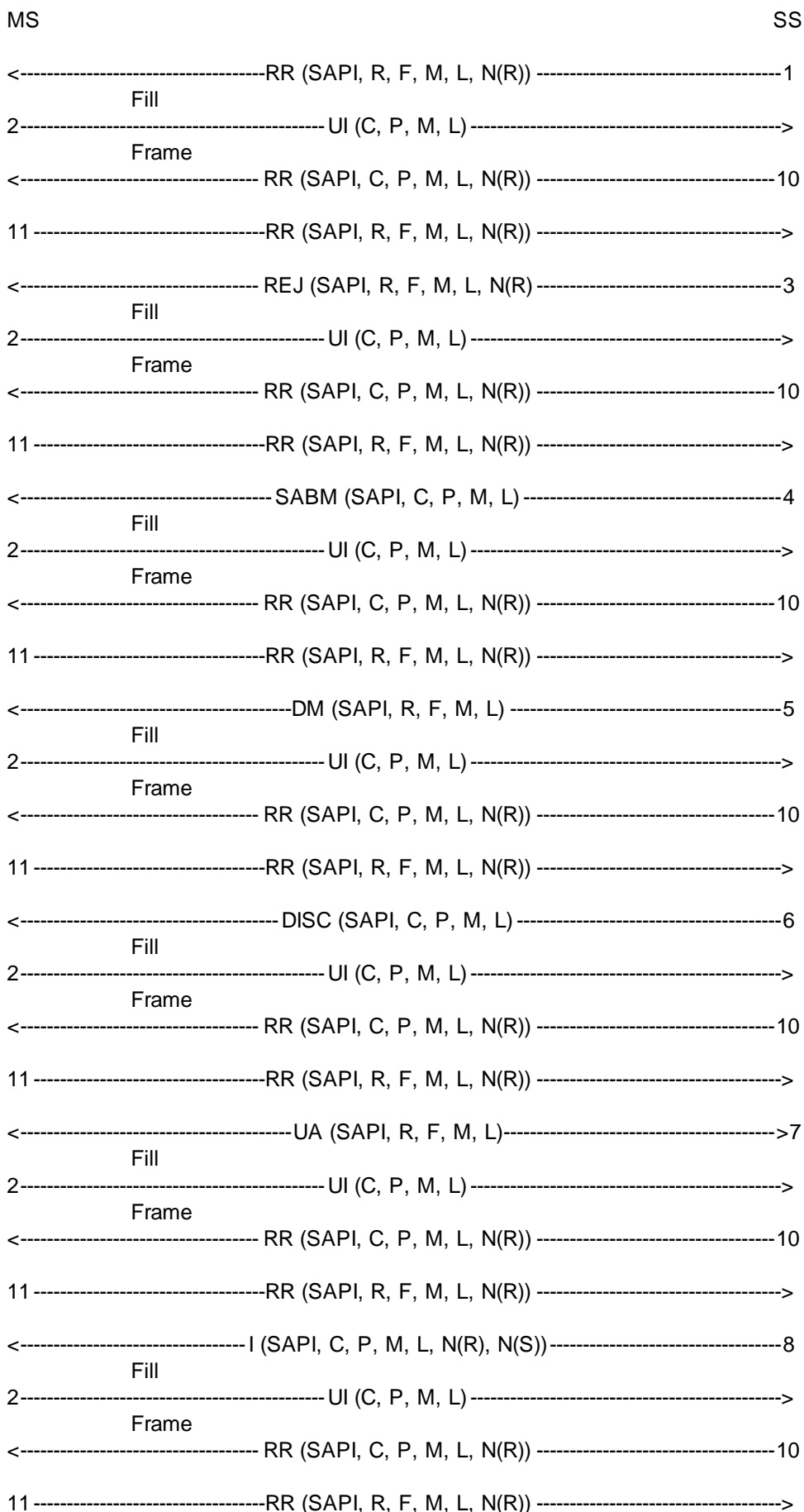
The SS shall then transmit an:

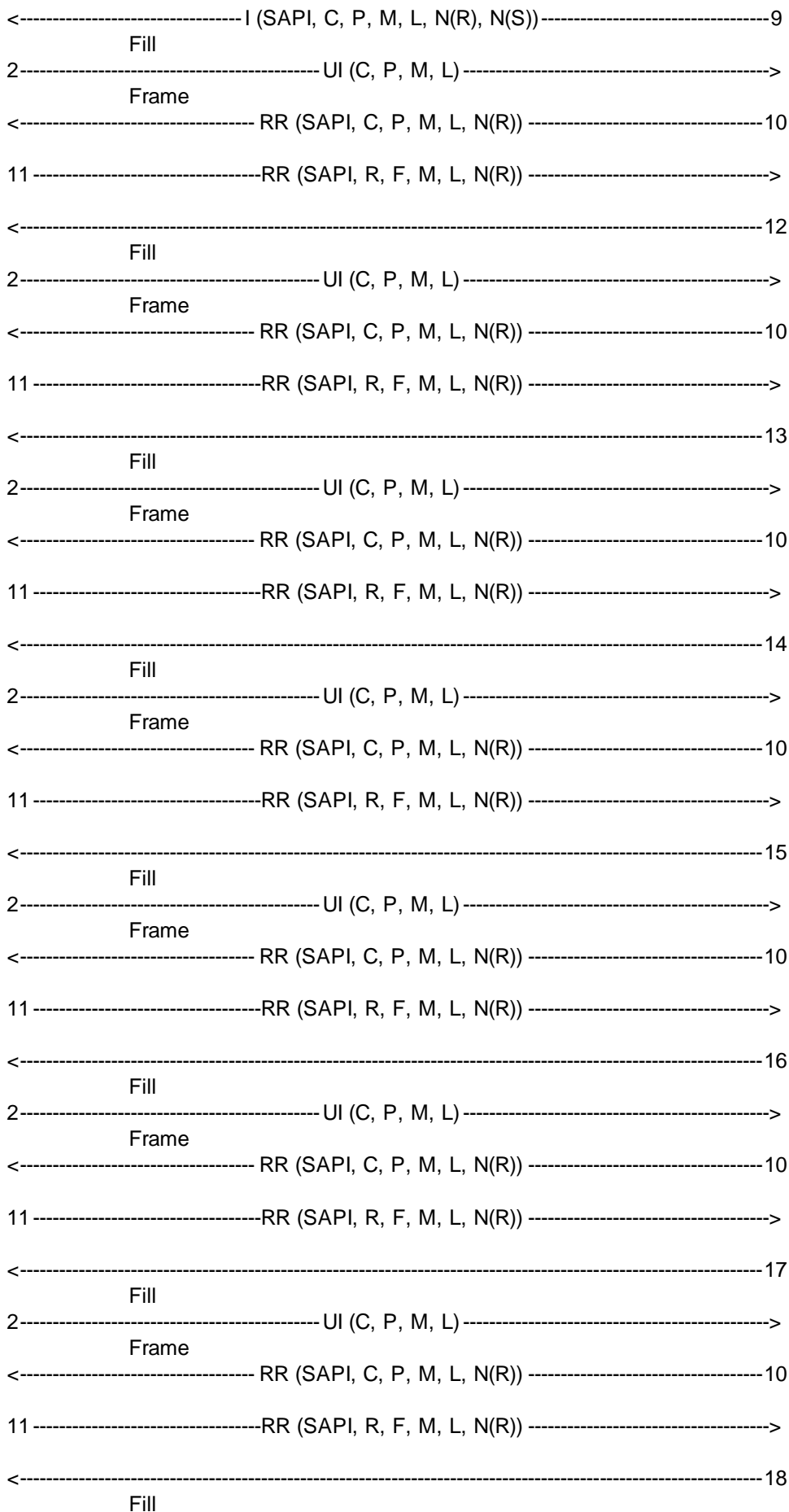
- RR frame with the Length indicator greater than zero and a faulty N(R)
- REJ frame with the EA bit set to zero and a faulty N(R)
- SABM frame with the EL bit set to zero
- DM frame with the Length indicator greater than zero
- DISC frame with the M bit set to 1
- UA frame with the EA bit set to zero
- I frame with the Length indicator greater than N201
- I frame with the M bit set to 1 and the Length indicator less than N201.
- command frames with correct Address and Length indicator field and a non-implemented control field.

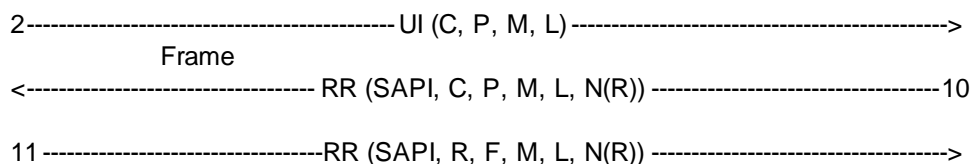
After T200 the SS shall in every case transmit an RR command, P bit set to 1.

The MS shall respond with an RR response, F bit set to 1.

Expected Sequence







The frames from the SS are:

1: One RR frame:

SAPI = 0, R = 0, F = 0, M = 0, L > 0, N(R) = 1

3: One REJ frame:

SAPI = 0, R = 0, F = 0, M = 0, L = 0, N(R) = 1, EA = 0

4: One SABM frame:

SAPI = 0, C = 1, P = 1, M = 0, L = 0, EL = 0

5: One DM frame:

SAPI = 0, R = 0, F = 1, M = 0, L > 0

6: One DISC frame:

SAPI = 0, C = 1, P = 1, M = 1, L = 0,

7: One UA frame:

SAPI = 0, R = 0, F = 0, M = 0, L = 0, EA = 0

8: One I frame:

SAPI = 0, C = 1, P = 0, M = 0, L > N201, N(R) = 0, N(S) = 6

9: One I frame:

SAPI = 0, C = 1, P = 0, M = 1, L < N201, N(R) = 0, N(S) = 7

10: One RR frame:

SAPI = 0, C = 1, P = 1, M = 0, L = 0, N(R) = 0

12: One command frame with

Control Field = xxx1 1101

13: One command frame with

Control field = xxx1 1011

14: One command frame with

Control field = xxx1 0111

15: One command frame with

Control field = 01x1 1111

16: One command frame with

Control field = 1xx1 1111

17: One command frame with

Control field = 0011 0011

18: One command frame with

Control field = 1xx1 0011

NOTE: An "x" stands for an arbitrary bit value.

25.2.7.3 Test requirements

The frames from the MS shall be:

2: One UI frame (occurs fifteen times):

$C = 0, P = 0, M = 0, L = 0$

11: One RR frame (occurs fifteen times):

$SAPI = 0, R = 1, F = 1, M = 0, L = 0, N(R) = 0$