



## ERTMS/ETCS

### FFFIS STM Test cases of Functional identity 003

#### LEVEL TRANSITIONS ETCS->STM (CS -> HS -> DA)

**Total: 29 Test cases**

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Company	Technical Approval	Management approval
ALSTOM		
ANSALDO		
AZD		
BOMBARDIER		
CAF		
SIEMENS		
THALES		

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## Modification History

Issue Number Date	Section Number	Modification / Description	Author
0.0.1 2004-07-01	All	Document created, including Test Case 3b.1.2.3.2.3.1, Test Case 3b.3.1, Test Case 3b.2.0.	P. Lührs (Siemens AG)
0.0.2 2004-07-02	several "Test Cases"	Test Case 3a.0.0.1.1.1.0.0.0 and Test Case 3a.0.0.2.2.0.0.0 added. Test Case 3b.1.2.3.2.3.1 updated: DUT and Output I/F, numbers of test steps. Test Case 3b.2.0 updated: List of "Packets Transmitted via FFFIS STM".	P. Lührs (Siemens AG)
0.0.3 2004-07-23	"Test Case Diagram" several "Test Cases"	Updated Test Case Diagrams included. Test Case 3a.0.0.1.1.1.0.0.0 updated: new requirement (10.5.2.8). Change in Methodology of Testing: padding bits included, opening of connections. All currently included Test Cases updated according to review comments. Test Case 3a.0.0.1.1.3.1.0, Test Case 3a.0.0.1.2.1.0.1.0.0.0, Test Case 3a.0.0.1.2.2.2.0.1.0.0.0, Test Case 3a.0.0.3.2.1.2.0.0.0, Test Case 3a.0.0.2.3.2 and Test Case 3c.1.0.3.1.1 added.	P. Lührs (Siemens AG)
0.0.4 2004-08-31	Footer "Test Case Diagram"  several "Test Cases"	Footer corrected. Overview diagram for Test Case Diagrams included and diagram Transition ETCS > STM: Level Transition border updated. All currently included Test Cases updated according to review comments. Test Case 3c.1.0.1.0.1.3.0.0, Test Case 3c.1.0.2.1.3.0.0, Test Case 3c.1.0.2.2.1, Test Case 3c.1.0.2.2.2.0, Test Case 3c.1.0.3.1.2.0 and Test Case 3c.1.0.4.1.3.0.0 added.	P. Lührs (Siemens AG)
0.0.5 2004-10-19	"Test Case Diagram" several "Test Cases"	Subset-035 requirement 7.4.1.2.2 included in the Test Case Diagrams. All currently included Test Cases updated according to review comments (Starting condition „Train State" and "DMI connection", Test Step numbering, Indication	P. Lührs (Siemens AG)

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		of request for Train Trip Acknowledgement, Safe Action, No MA in Balise Group at Level Transition border to STM, The STM may send information based on the national system behaviour to the ETCS On-board after activation, Check of "STM Max Speed" in the supervision gap updated (Test Case 3c.1.0.1.0.1.3.0.0)).	
0.0.6 2004-11-04	"Test Case Diagram"	Test Case Diagram updated due to VISIO/WORD-Problems (connections). Subset-035 requirement 5.2.10.1 ("DMI preliminary requests", "FS"/"SR"/"OS"/"NL"/"UN"/"TR") included in the Test Case Diagrams. Test Case Diagram "Transition ETCS->STM: Level Transition border" corrected.	P. Lührs (Siemens AG)
	several "Test Cases"	All currently included Test Cases updated according to review comments (Starting condition „TIU Sleeping Status”). Subset-035 requirement 7.4.1.2.2 included in the Test Case Headers. Connection information for all transmitted PROFIBUS messages added in the Test Cases. The STM shall report the state to all connected ETCS Functions (Requirement 7.3.4.4). Test Case 3b.4.1, Test Case 3b.5.1, Test Case 3b.6.1, Test Case 3b.7.1, Test Case 3b.8.2.0 added to test the requirement 5.2.10.1 ("DMI preliminary requests", "SR"/"OS"/"NL"/"UN"/"TR"). Test Case 3b.3.1 is valid only for "FS". Missing test cases (Test Case 3b.1.1, Test Case 3b.1.2.1, Test Case 3b.1.2.2.1, Test Case 3b.1.2.3.1, Test Case 3b.1.2.3.2.1, Test Case 3b.1.2.3.2.3.4.0, Test Case 3b.1.2.3.2.3.5.1, Test Case 3b.1.2.3.2.4.0, Test Case 3b.1.2.3.2.5.1, Test Case 3b.1.2.3.3.1, Test Case 3b.1.2.3.4.0, Test Case 3b.1.2.3.5.1, Test Case 3b.1.2.4.0, Test Case 3b.1.2.5.1, Test Case 3b.1.3.1, Test Case 3b.1.4.0, Test Case 3b.1.5.1, Test Case 3c.1.0.5.1.0.1.0, Test Case 3c.1.0.5.2.0.2, Test Case 3c.1.0.5.3.2.0, Test Case 3c.1.0.4.2.0.1.0, Test Case 3c.1.0.4.3.2.0, and Test Case 3c.2.0.2.1.3.0.0) added).	P. Lührs (Siemens AG)
0.0.7 2004-11-18	"Test Case Diagram"  several "Test Cases"	Subset-035 requirement 5.10.1.2 (DMI preliminary requests) for the ETCS mode "PT" included in the Test Case Diagrams.	P. Lührs (Siemens AG)

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		<p>All currently included Test Cases updated according to review comments (selected language "English", no DMI messages in Test Case 3c.1.0.5.2.0.2, ETCS mode does not change in Test Case 3c.1.0.5.2.0.2, driver acknowledge-ment for transition added to all Test Case 3c except for starting condition SL, justification for specification of Test Case 3c.1.0.1.0.1.3.0.0 added, ...).</p> <p>All Test Case 3b updated due to the inclusion of Subset-035 requirement 5.10.1.2 (DMI preliminary requests) for the ETCS mode "PT".</p> <p>Starting / end conditions corrected.</p>	
0.0.8 2004-11-30	all "Test Cases"	"Reference Clock Connection" included in the end condition. "Not transmitted" parts of telegrams deleted.	P. Lührs (Siemens AG)
0.0.9 2004-12-07	Several	Minor mistakes corrected (requirements lists in the test cases, ...).	P. Lührs (Siemens AG)
0.1.0 2004-12-15		Editorial changes for preliminary delivery.	P. Lührs (Siemens AG)
0.1.1 2005-01-24	Several Test Cases	Test Case 3a.0.0.1.1.1.0.0.0, Test Case 3a.0.0.1.2.1.0.1.0.0.0, Test Case 3a.0.0.2.2.0.0.0, Test Case 3c.1.0.4.2.0.1.0, Test Case 3c.1.0.5.1.0.1.0, and Test Case 3c.1.0.5.2.0.2 updated based on new review comments (new feature of the test equipment: parallel time lines, minor mistakes corrected).	P. Lührs (Siemens AG)
0.1.2 2005-01-26	Several Test Cases	„The STM takes the train supervision according to the national system behaviour.“ (BIU connection) added and minor mistakes corrected.	P. Lührs (Siemens AG)
0.1.3 2005-01-26	Several Test Cases	Title updated and mistakes corrected.	P. Lührs (Siemens AG)
0.2.0 2005-01-27		Editorial changes for delivery.	P. Lührs (Siemens AG)
1.0.0 13.10.2005		Editorial changes for delivery	Invensys Rail
2.9.1 30.01.2013	All	Updated to be in line with Subset 35 issue 3.0.0 date 2010-02-29, SRS issue 3.3.0 date 2012-03-07 and ETCS DMI specification issue 3.3.0 date 2012-03-01	SIEMENS F. Simon
2.9.2 30.08.2013	All	Review comments of second review	SIEMENS F. Simon
2.9.3	Diagram A:		

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31.10.2013	Diagram B: Diagram G Diagram K Diagram I Testcases 3a.6, 3a.7, 3a.8, 3b.6, 3c.1, 3k.1, 3g.1, 3g.2, 3i.1	Changes due to CR 1158: impact from CR 1173 and STMWG comments	SIEMENS F. Simon
2.9.4 28.02.2014	Test cases 3a.6, 3a.8 3b.1, 3b.3, 3b.6, 3b.9, 3i.1, table Supplier specific delays Test Cases 3g.1, 3g.2 Test case 3c.3	STM MAX speed is not displayed in SN.  NID_BUTPOS is coded on 5 bits. Deleted step 2	SIEMENS F. Simon
2.9.5 2014-04-24	Front page	Baseline 3 1 <sup>st</sup> Maintenance pre-release version	Thomas Mandry (Alstom)
3.0.0 2014-05-09	-	Baseline 3 1 <sup>st</sup> Maintenance release version	Philippe Prieels
3.0.1 2015-08-17	CR1242 impact Testcases 3d.1, 3e.1, 3e.2, 3g.1, 3g.2, 3h.1, 3h.2 3d.1, 3d.2, 3f.1, 3f.2 3a.6, 3b.3, 3i.1	CR 1278: impact from CRs 1094 & 1242 and from STMWP review New requirement 11.1.1.1.1 and formal changes in 11.1.1.1a and 11.1.1.1b and 10.3.2.7  New testcase 3d.2, drawing of 3d.1, 3f.1, 3f.2 due to 10.2.1.2c Review results	SIEMENS F. Simon
3.0.2 2015-10-19	No change to this part of the Subset	CR 1278: Updated according to SUBSET-074v301ERAreview	Thomas Mandry (Alstom)
3.1.0 2015-12-16	-	Baseline 3 2 <sup>nd</sup> release version	Thomas Mandry (Alstom)



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## Supplier-specific delays

#	Supplier of	Start time	End time
Ts1		Intentionally deleted	
Ts2		Intentionally deleted	
Ts3	ETCS	Reference time of reception of Transition Announcement	Reference time of indication of the target speed "0" on the DMI
Ts4	ETCS	Time-stamp of reception of STM MAX SPEED	Reference time of indication of STM MAX SPEED in MRSP on the DMI
Ts5	ETCS	Time-stamp of reception of STM SYSTEM SPEED	Reference time of indication of STM SYSTEM SPEED in MRSP on the DMI
Ts6		Intentionally deleted	
Ts7		Intentionally deleted	
Ts8	ETCS	Reference time of reception of Packet 44 from Balise	Time-tamp of message including related STM-45
Ts9	ETCS	Reference time of reception of Transition Announcement, or timestamp of mode change to SB	Time-stamp of message including STM-14 "CS"
Ts10	ETCS	Reference time of establish connection to TIU	Time-stamp of message including STM-141 and 139
Ts11	ETCS	Reference time of establish connection to BIU	Time-stamp of message including STM-143 and 136
Ts12		Intentionally deleted	
Ts13	ETCS	Reference time of change of BIU status	Time-stamp of message including STM-136
Ts14	STM	Time-stamp of reception of STM State order STM-14 to "CS"	Time-stamp of message including STM-15 "CS"
Ts15	STM	Time-stamp of message containing STM-14 state order to CO	Time-stamp of message including STM-15 "FA" due to failure in ETCS state order
Ts16		Intentionally deleted	
Ts17		Intentionally deleted	
Ts18	ETCS	Reference time of isolation input to ETCS	Reference time of release of Intervention due to safe action
Ts19	ETCS	Reference time of manual Level Change from Level NTC to ETCS Level 0/1/2/3	Reference time of end of STM Max Speed Supervision on the DMI
Ts20	ETCS	Time-stamp of reception of active state report	Time-stamp of message including STM-14 "CS" after manual change of level

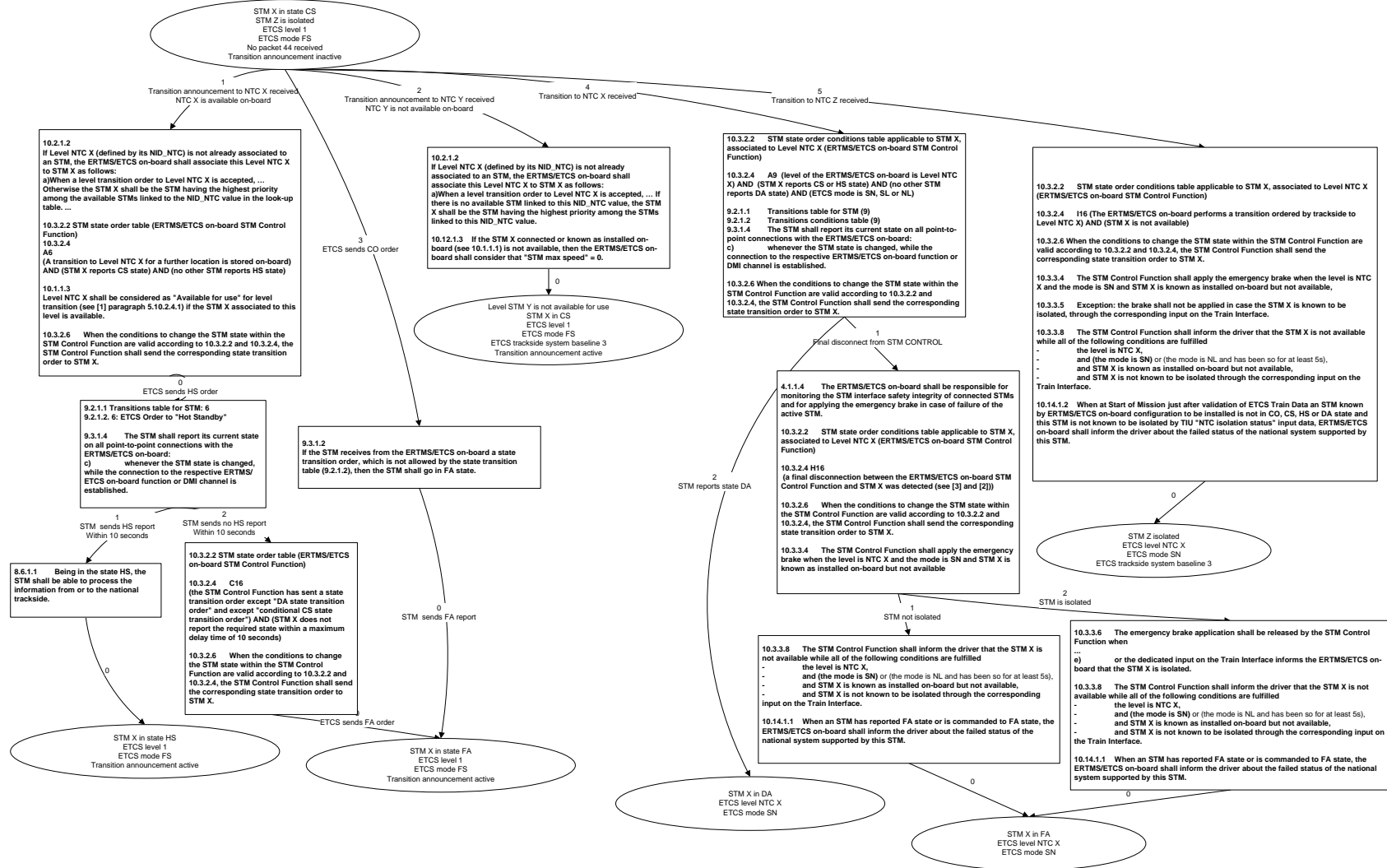
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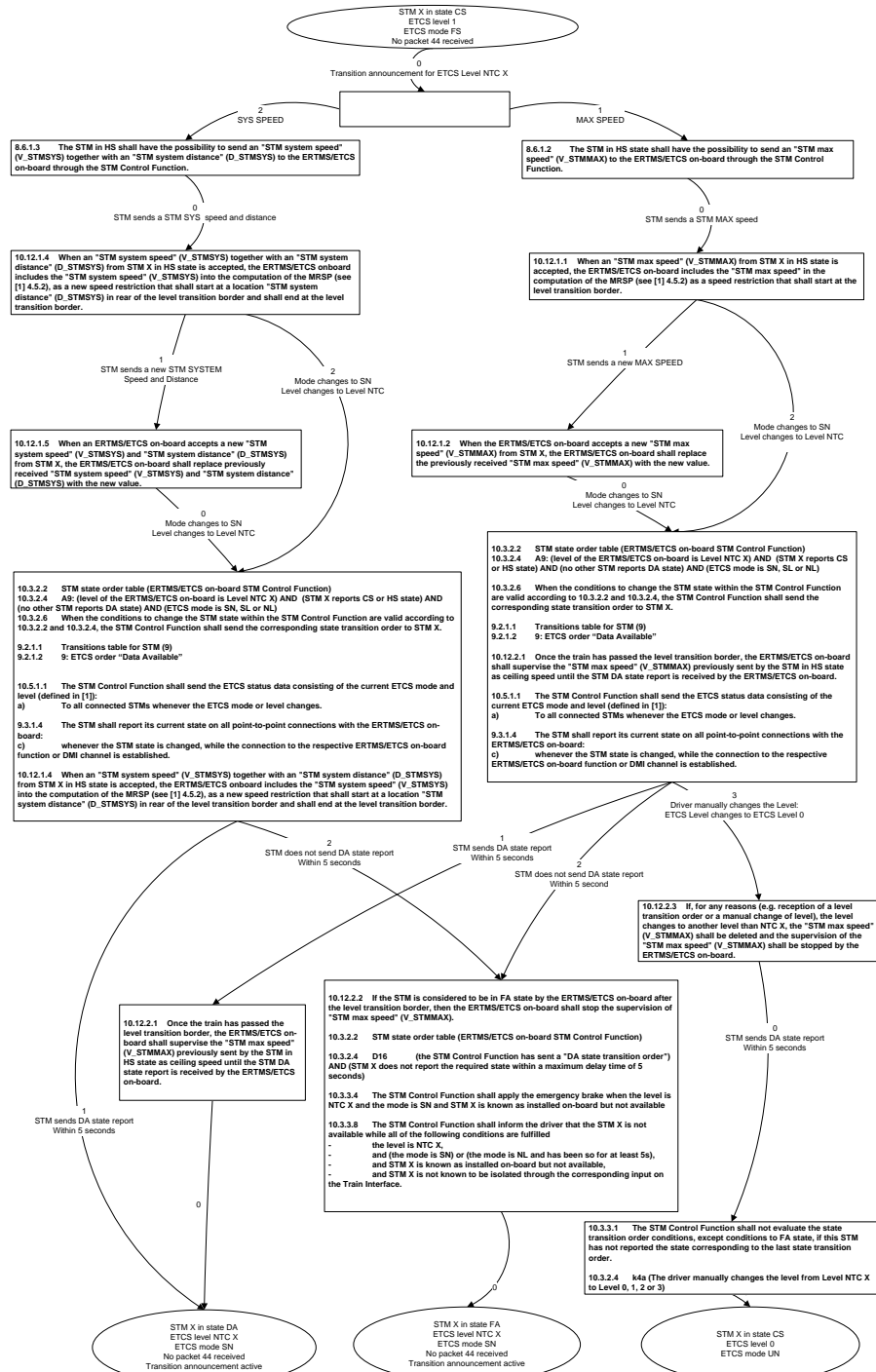


Ts21	ETCS	Reference time of Level Transition Order to Level NTC	Reference time of driver information display about the unavailable STM.
Ts22	ETCS	Reference time of acknowledgement of driver information about failed STM.	Reference time of driver information display about the unavailable STM.
Ts23	ETCS	Reference time considering STM in FA state (due to STM failure)	Reference time of driver information display about the failed STM.
Ts24	ETCS	Time Stamp of reception of STM MAX speed	Reference time of Service Brake Application due to the supervision of STM MAX Speed
Ts25	ETCS	Time Stamp of reception of STM system speed and distance	Reference time of Service Brake Application due to the supervision of STM System Speed and Distance

Diagram A

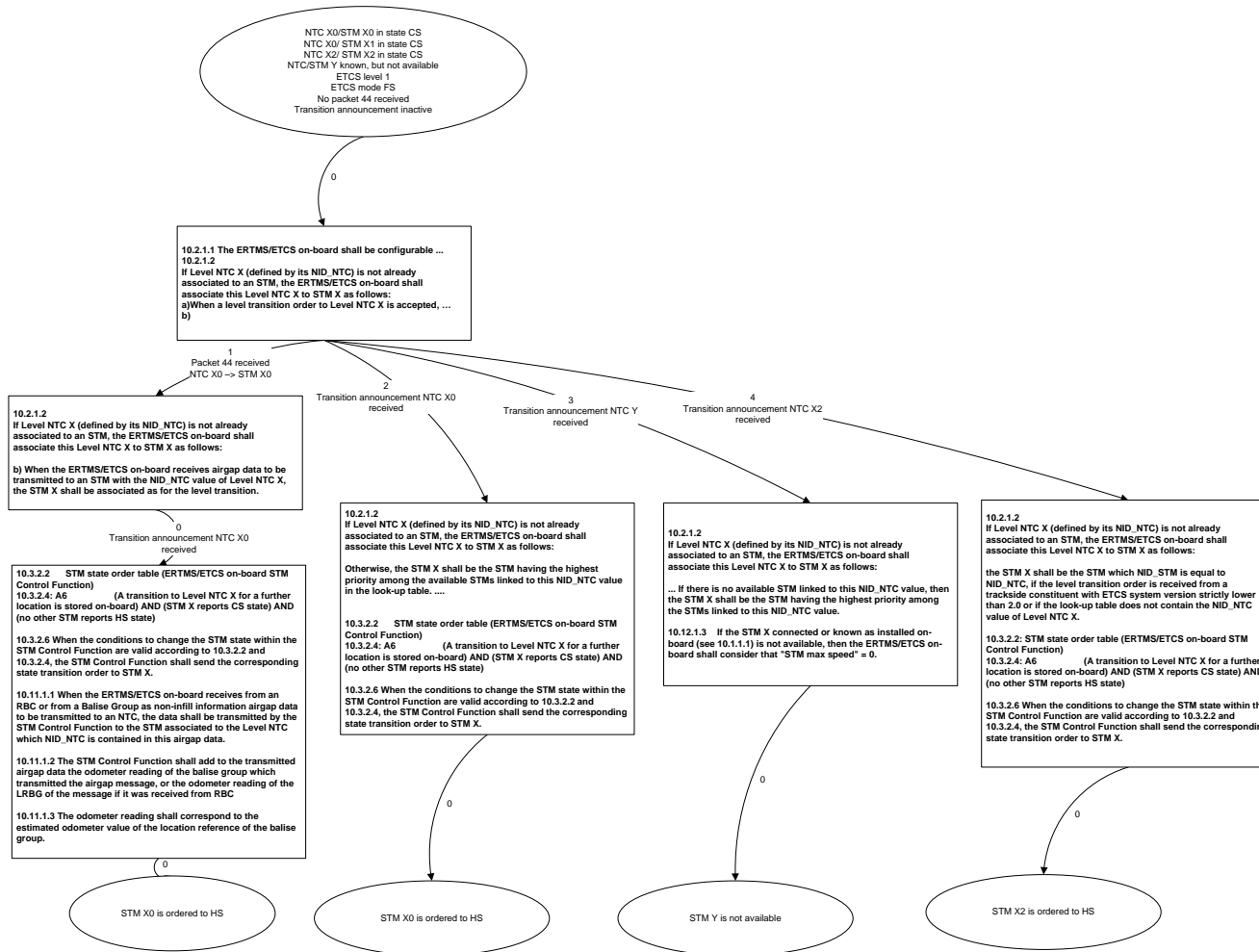


## Diagram B



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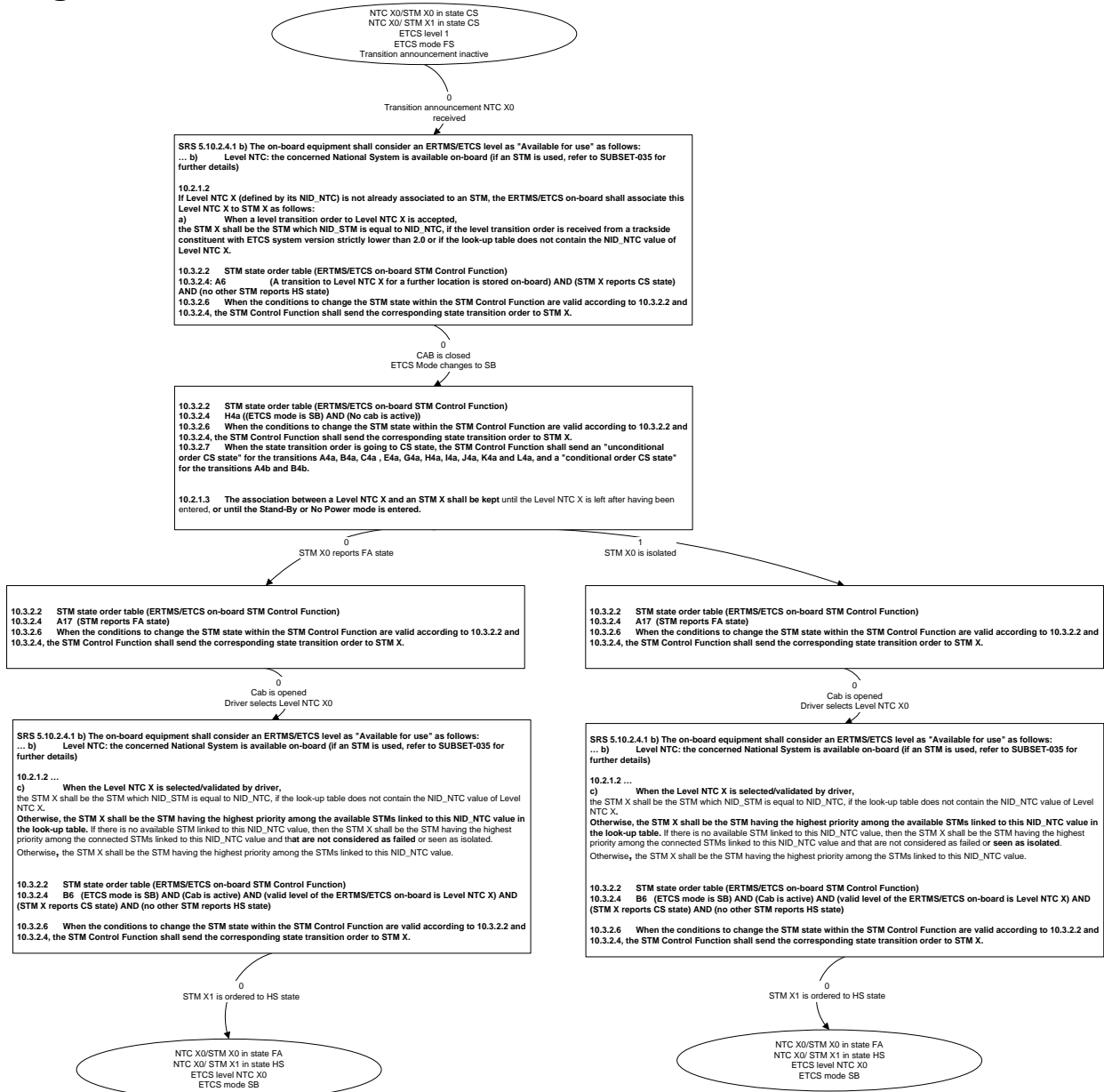
Diagram C



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Diagram D



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**Diagram E**

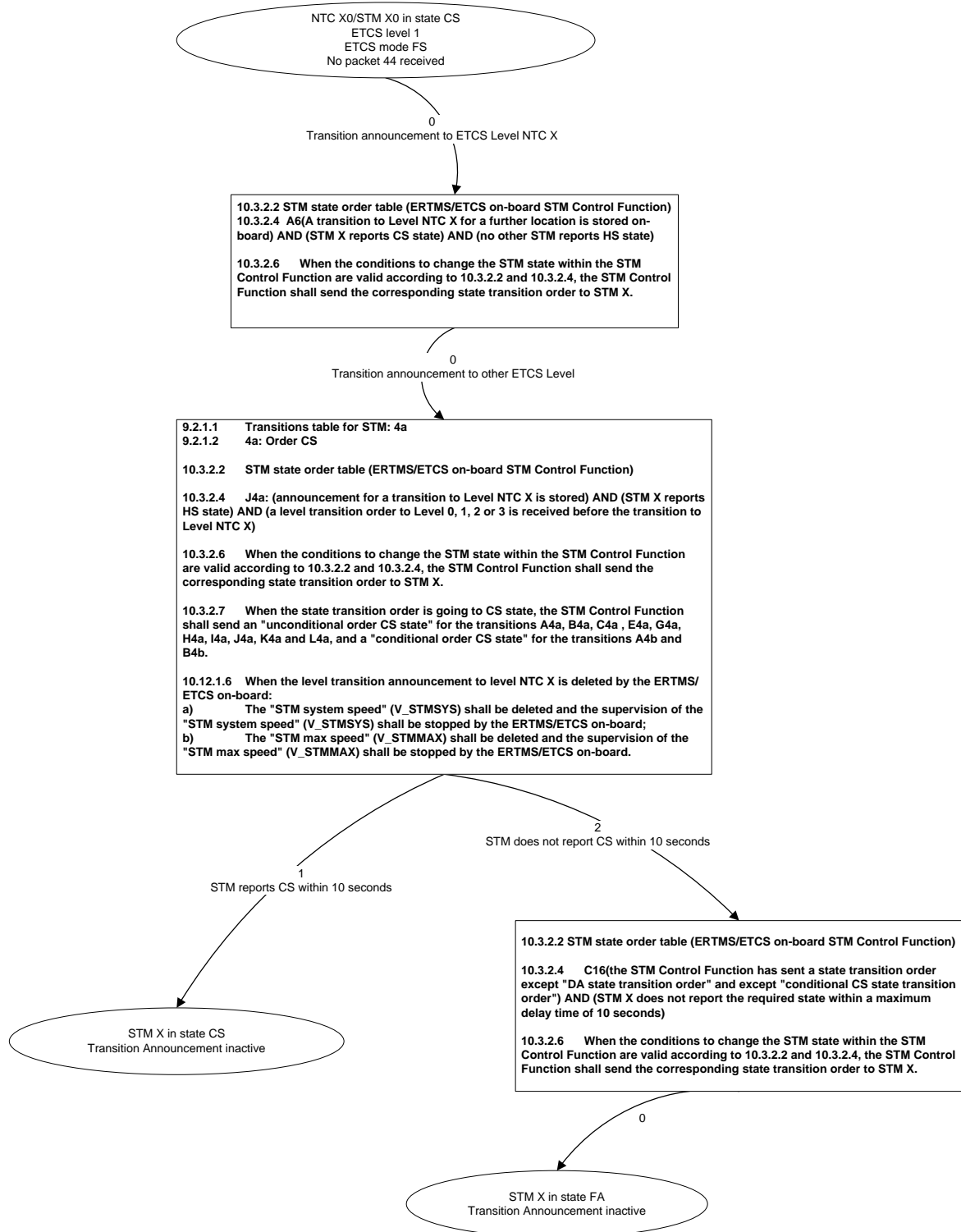
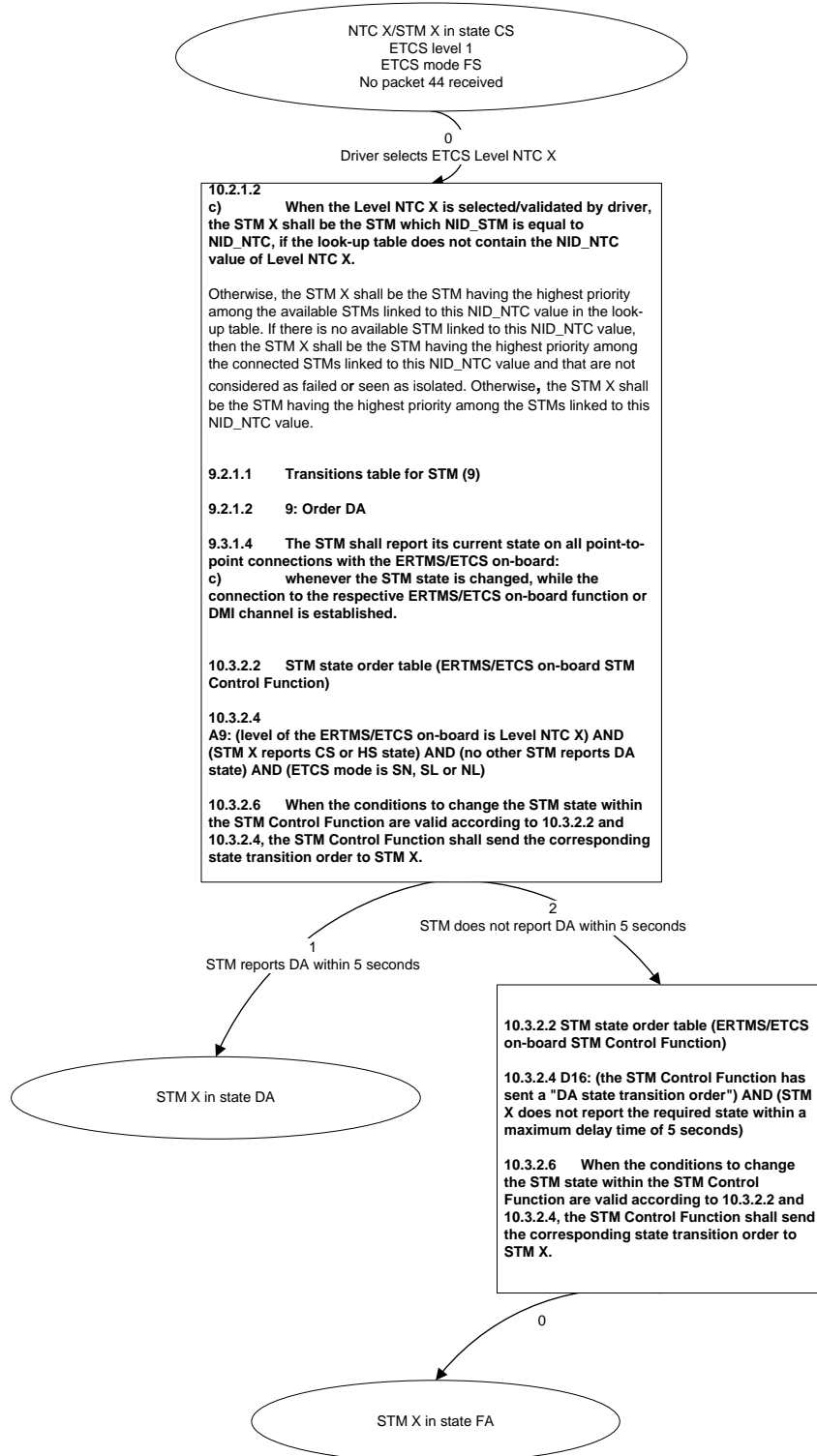


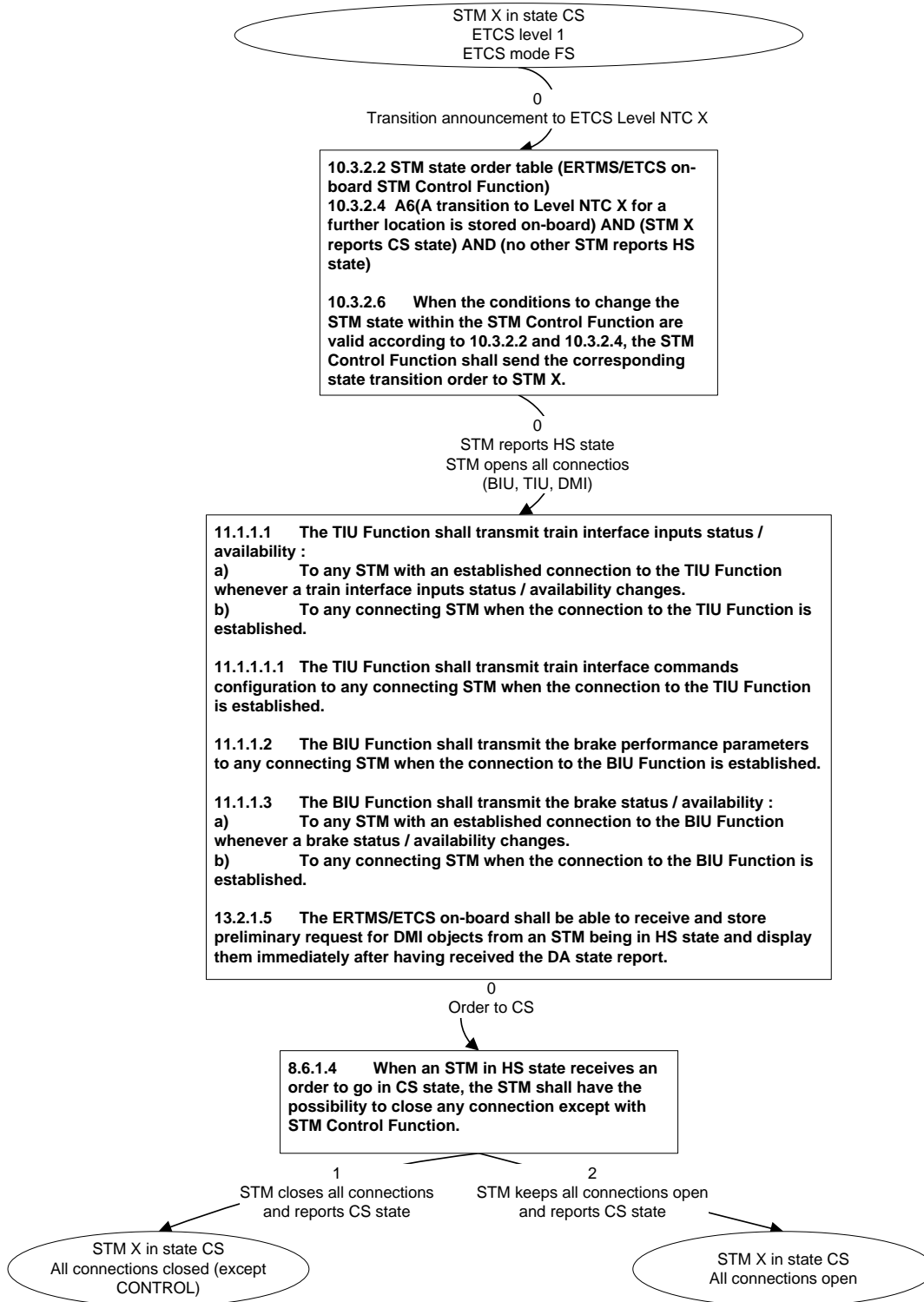


Diagram F

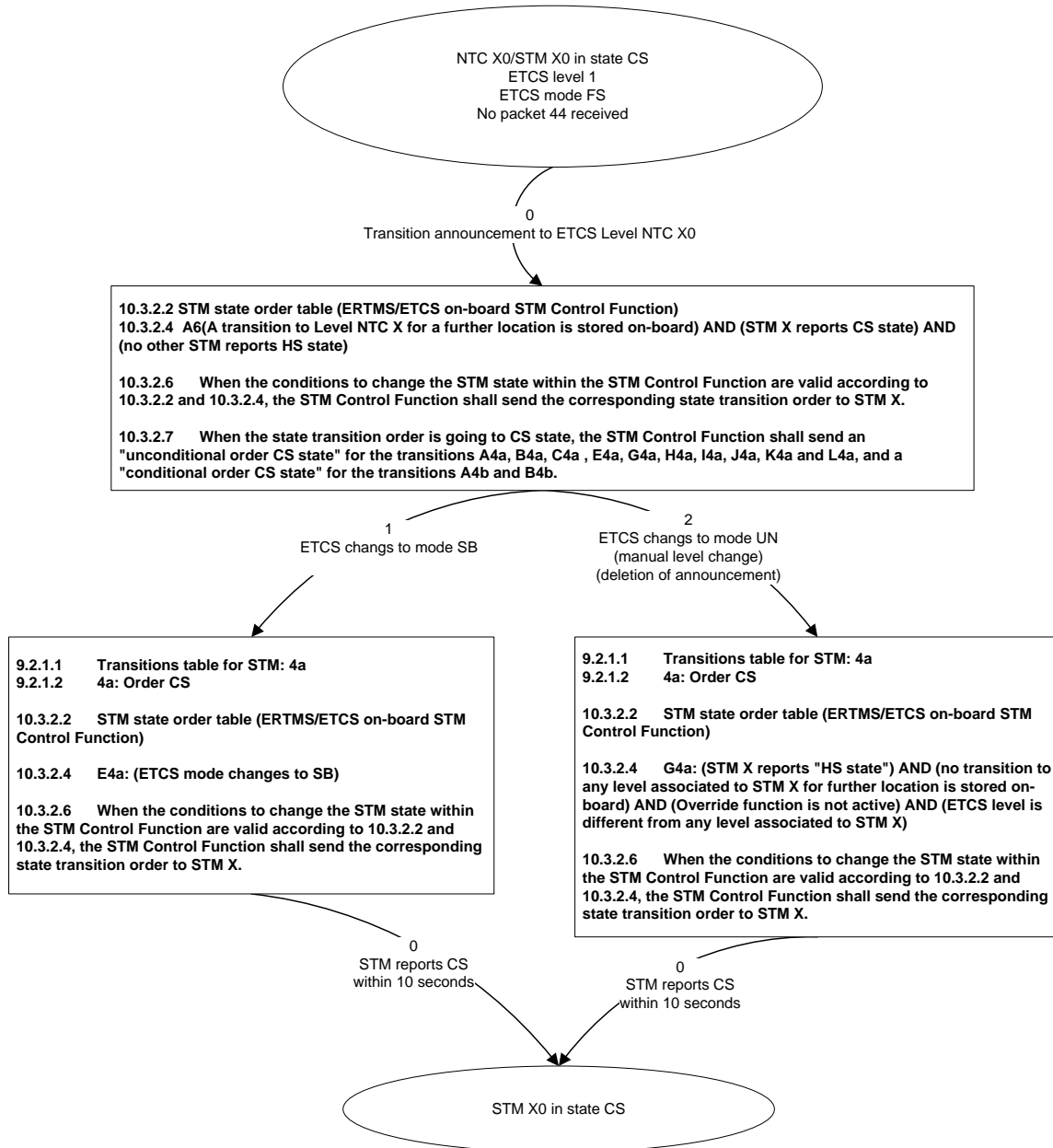




**Diagram G**



**Diagram H**



**Diagram I**

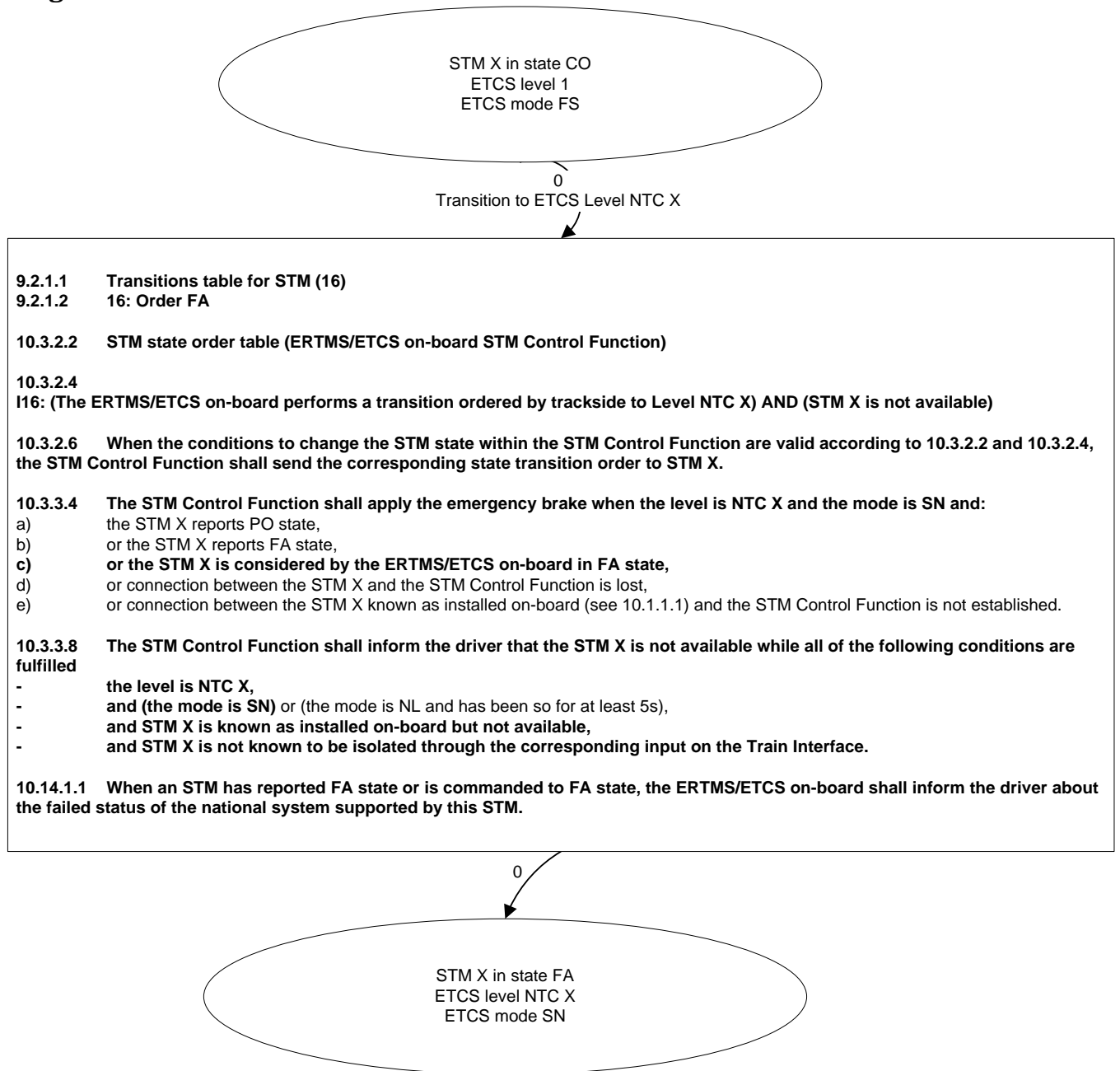
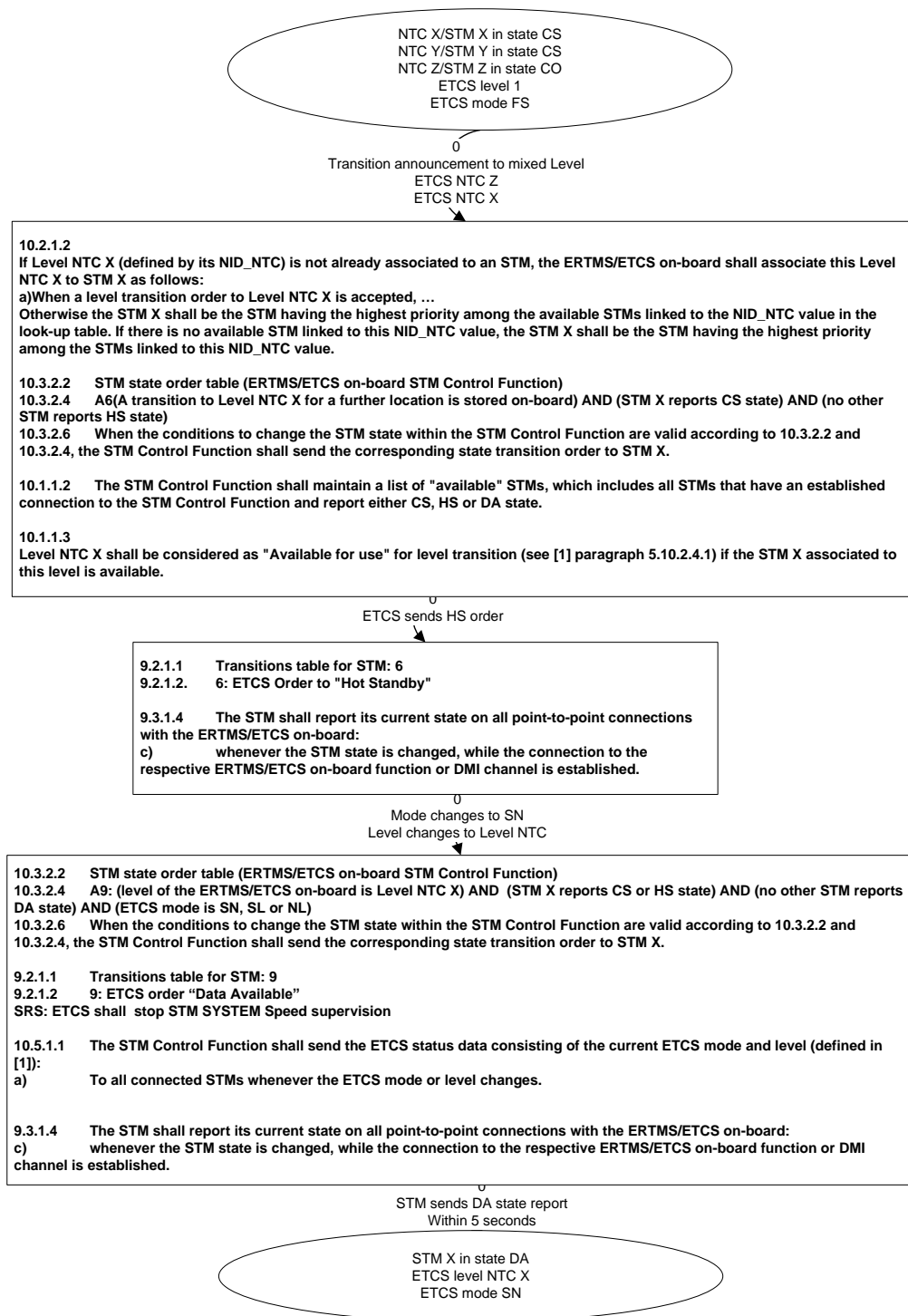
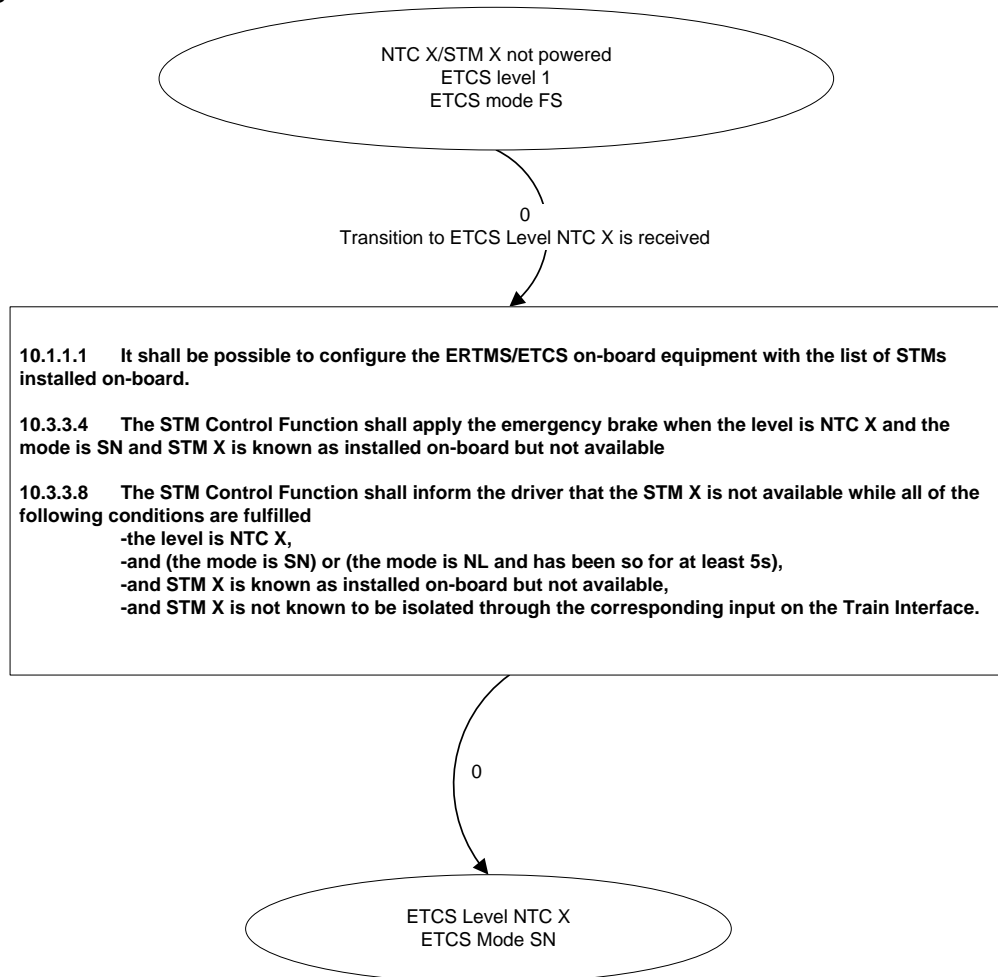


Diagram J



**Diagram K**





## Test Case 3a.1

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3a.1.0.1.0
	Check the behaviour of the ERTMS/ETCS on-board and the STM at a level transition announcement (announced by balise group), when no other STM is currently in the state HS and the STM follows the state transition order to state HS in due time.
ERTMS/ETCS on-board requirements tested	Subset-035 10.1.1.3, 10.2.1.2a, 10.3.2.2 (A6), 10.3.2.4 (A6), 10.3.2.6
STM requirements tested	Subset-035 9.2.1.1 (6), 9.2.1.2 (6), 9.3.1.4c
Packets transmitted via FFFIS STM	Packet STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state HS when a level transition announcement to this STM is received</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State	CS	no STM in state HS or state DA
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	

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#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-B1 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection: Message-EC1 (STM-14 - state order to STM) Time T1
2	STM reports state HS	PROF	T1 + 5 s	STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T1 + 7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function

#### STM Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	STM is ordered to state HS and reports in time	PROF	T0	STM Control Connection: Message-EC1 (STM-14 - state order to STM)	PROF	10 s	STM Control Connection: Message-S2 (STM-15 - state report from STM)

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group

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Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	1111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-S2 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

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End Conditions	Value	Comments
STM State	HS	
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Status	not relevant	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	

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BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

## Test Case 3a.2

TEST CASE HEADER	
<b>Test case identification</b>	Level Transitions ETCS->STM (CS -> HS -> DA)
	3a.1.0.2.0
	Check the behaviour of the ERTMS/ETCS on-board and the STM at a level transition announcement (announced by balise group), when no other STM is currently in the state HS and the STM does not follow the state transition order to state HS in due time.
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035 10.1.1.3, 10.2.1.2a, 10.3.2.2 (A6, C16) , 10.3.2.4 (A6, C16), 10.3.2.6
<b>STM requirements tested</b>	
<b>Packets transmitted via FFFIS STM</b>	Packet STM-14
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
<b>Comments and constraints</b>	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state HS when a level transition announcement to this STM is received and the state FA is ordered, if the STM does not follow this order.</p> <p>Odometer speed shall be 36 km/h.</p>

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Starting Conditions	Value	Comments
STM State	CS	no STM in state HS or state DA
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	

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#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> STM transition: order announced STM to HS state Time: T0	BTM	T0	Telegram-B1 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection: Message-EC1 (STM-14 – HS state order to STM) Time T1
2	Timeout after 10 seconds	-	T1 + 10 s	-	PROF	5s	STM Control Connection: Message-EC2 (STM-14 – FA state order to STM)
3	Driver acknowledges LTR	DMI	T1 + 11 s	Ack by driver	PROF	5s	No FA state order sent to STM control function

#### STM Test Case

Not applicable

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	Unlinked
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group

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Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC2 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	state FA
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM State	FA	
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Status	not relevant	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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### Test Case 3a.3

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3a.3.0
	Check the behaviour of the STM at a level transition announcement (announced by balise group), when no other STM is currently in the state HS and the ETCS sends a state order, that is not defined in this state (here: CO).
ERTMS/ETCS on-board requirements tested	
STM requirements tested	Subset-035 9.3.1.2
Packets transmitted via FFFIS STM	Packet STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
Comments and constraints	Odometer speed shall be 36 km/h.



Starting Conditions	Value	Comments
STM State	CS	no STM in state HS or state DA
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	

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#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
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#### STM Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> STM transition: order announced STM to HS state Time: T0	PROF	T0	STM Control Connection: Message-EC1 (STM-14 – CO state order to STM)	PROF	Ts15	STM Control Connection: Message-S2 (STM-15 – FA state report from STM) Time T1

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	3	state CO
Padding bits	COMPUTED	NOT RELEVANT	

Message-S2 (state report from STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X

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Message-S2 (state report from STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	8	state FA
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM State	FA	
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Status	not relevant	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3a.4

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3a.2.0
	Check the behaviour of the STM at a level transition announcement (announced by balise group), when the STM is not available on-board.
ERTMS/ETCS on-board requirements tested	Subset-035 10.2.1.2 a), 10.12.1.3
STM requirements tested	Subset-035
	none
Packets transmitted via FFFIS STM	none
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> <li>- STM Y is not installed on-board</li> </ul>
Comments and constraints	Odometer speed shall be 36 km/h.



Starting Conditions	Value	Comments
STM State (STM X)	CS	STM installed On-Board and working
STM Y State	NP	STM not installed, not powered,
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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Starting Conditions	Value	Comments
NTC Y Isolation Status	Not isolated	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC Y transition NTC Y is not available on-board, no alternatives in table of priority	BTM	T0	Telegram-B1 (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order), Telegram-B2	DMI	-	Transition announcement to NTC Y
2	"STM Max Speed" is set to "0" as the announced STM is not available	-	T0	-	DMI	-	the indication of the target speed (at the transition border) is set to "0 km/h"
3	Driver acknowledges LTR	DMI	T0 + 7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function

#### STM Test Case

Not applicable

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC Y
NID_NTC	8	FINITE VALUE	valid value for NID_NTC Y
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	0	mixed level area: no
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

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End Conditions	Value	Comments
STM State (STM X)	CS	STM X in CS
STM State (STM Y)	NP	
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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NTC Y Isolation Status	not isolated	
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## Test Case 3a.5

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3a.4.2
	ETCS Level Transition without announcement
ERTMS/ETCS on-board requirements tested	Subset-035 10.3.2.2 (A9), 10.3.2.4 (A9), 10.3.2.6
STM requirements tested	Subset-035 9.2.1.1 (9), 9.2.1.2 (9), 9.3.1.4c
Packets transmitted via FFFIS STM	Packet STM-5, STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state DA when a level transition to this STM is received (without announcement).</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State	CS	no STM in state HS or state DA
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	

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#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	Level Transition for an ETCS - > NTC transition: order announced STM to DA state	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection: Message-EC1 (STM-14 - state order to STM) Time T1
2	STM reports state DA	PROF	T1 + 3 s	STM Control function: Message S1 STM-15 from STM	PROF	5s	No FA state order shall be send to STM

#### STM Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	STM is ordered to state DA	PROF	T0	STM Control Connection: Message-EC1 (STM-14 - state order to STM)	PROF	5s	STM Control Connection: Message-S1 (STM-15 - state report from STM) Time T1

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	Unlinked

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC, specified by NID_NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

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Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	state DA
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
M_MODE	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	state DA
Padding bits	COMPUTED	NOT RELEVANT	

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End Conditions	Value	Comments
STM State	DA	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Status	not relevant	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3a.6

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3a.4.1.1.0
	ETCS Level Transition without announcement, STM disconnects finally
ERTMS/ETCS on-board requirements tested	Subset-035 4.1.1.4, 10.3.2.2 (H16), 10.3.2.2 (A9), 10.3.2.4 (A9), 10.3.2.4 (H16), 10.3.3.4 , 10.3.3.8, 10.14.1.1
STM requirements tested	
Packets transmitted via FFFIS STM	Packet STM-5, STM-14
ERTMS/ETCS on-board configuration	- STM X installed on-board
	- STM X corresponds to NTC X by configured table
Comments and constraints	The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) takes the safe action when a final disconnect on STM Control function from this STM is received .
	Testcase starts with the reception of transition balise group. Driver acknowledge shall be received in the announcement area.
	Odometer speed shall be 36 km/h.



Starting Conditions	Value	Comments
STM State	CS	no STM in state HS or state DA
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	

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#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	Level Transition for an ETCS -> NTC transition: order announced STM to DA state	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	PROF	5s	STM Control Connection: Message-EC1 (STM-14 - state order to STM) Time T1
2	STM disconnects finally	PROF	T1 + 3 s	Profibus final disconnect from STM	TIU	5s	Safe Action due to final disconnect of STM Control function of active STM
-	ETCS considers the STM in FA state (H16)	-	-	STM is considered to be in FA due to H16	DMI	Ts23	Driver is informed about the failed STM.
3	Driver acknowledges failed STM information	DMI	T1 + 10s	Ack by driver	DMI	Ts22	Driver is informed about the unavailable STM

#### STM Test Case

Not applicable

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile, Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC, specified by NID_NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

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Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	state DA
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
M_MODE	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM State	FA	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	not relevant	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Status	not relevant	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3a.7

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3a.5.0
	ETCS Level Transition without announcement, STM is not available, isolated
ERTMS/ETCS on-board requirements tested	Subset-035 10.3.3.4 ,10.3.3.5, 10.3.3.8, 10.14.1.2
STM requirements tested	
Packets transmitted via FFFIS STM	
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM Z installed on-board</li> <li>- STM Z corresponds to NTC Z by configured table</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) does not order the STM to the state FA when a STM is not available, but brakes are not applied (STM is isolated)</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM Z State	NP	STM Z is isolated
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC Z Isolation Status	isolated	

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#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	Level Transition for an ETCS - > NTC Z transition	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	PROF	5 s	No output from ETCS (STM Z is isolated) to STM or brakes
	-	-	T0	-	DMI	5s	No Information of driver about the failed, unavailable (isolated) STM.

#### STM Test Case

Not applicable

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC, specified by NID_NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	0	No mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information



End Conditions	Value	Comments
STM State	NP	Not changed (isolated)
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Status	not relevant	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC Z Isolation Status	isolated	

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## Test Case 3a.8

TEST CASE HEADER	
<b>Test case identification</b>	Level Transitions ETCS->STM (CS -> HS -> DA)
	3a.4.1.2.0
	ETCS Level Transition without announcement, STM disconnects finally and gets isolated
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035 4.1.1.4, 10.3.2.2 (H16), 10.3.2.4 (H16), 10.3.2.6, 10.3.3.4, 10.3.3.6 (e), 10.3.3.8, 10.14.1.1
<b>STM requirements tested</b>	
<b>Packets transmitted via FFFIS STM</b>	Packet STM-5, STM-14
<b>ERTMS/ETCS on-board configuration</b>	- STM X installed on-board
	- STM X corresponds to NTC X by configured table
<b>Comments and constraints</b>	The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) considers the STM to be in the state FA when a final disconnect on STM Control function from this STM is received (without announcement) (emergency brake shall be applied), emergency brake shall be released after STM isolation
	Odometer speed shall be 36 km/h.





Starting Conditions	Value	Comments
STM State	CS	no STM in state HS or state DA
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	

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#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	Level Transition for an ETCS - > NTC transition: order announced STM to DA state	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	PROF	5s	STM Control function: Message-EC1 (STM-14 - state order to STM) Time T1
2	STM disconnects finally	PROF	T1 + 3 s	final disconnect from STM Control Function on safety layers	TIU	5s	Apply Emergency Brake due to final disconnect of STM Control function of active STM
-	ETCS considers the STM in FA state (H16)	-	-	STM is considered to be in FA due to H16	DMI	Ts23	Driver shall be informed about the failed STM
3	Driver acknowledges information about the failed STM	DMI	T1 + 10s	Ack by driver	DMI	Ts22	Driver is informed about the unavailable STM
4	STM is isolated	TIU	T1 + 15 s	STM is isolated	TIU	Ts18	Release Emergency Brake
-	-	-	-	-	DMI	5 s	The driver information about "unavailable STM" is deleted from the DMI

#### STM Test Case

Not applicable

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC, specified by NID_NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group

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Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	Unlinked
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	state DA
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
M_MODE	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM State	FA	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	not relevant	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Status	not relevant	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Isolated	

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## Test Case 3b.1

TEST CASE HEADER	
<b>Test case identification</b>	Level Transitions ETCS->STM (CS -> HS -> DA)
	3b.0.1.0.1.0.1.0
	Check the behaviour of the STM and the ERTMS/ETCS on-board after reception of level transition announcement (announced by balise group). This includes the transmission of STM MAX Speed and retransmission before transition, with a service brake application by ERTMS/ETCS on-board.
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035 8.6.1.2, 10.3.2.2 (A9), 10.3.2.4 (A9), 10.3.2.6, 10.5.1.1a, 10.12.1.1, 10.12.1.2, 10.12.2.1
<b>STM requirements tested</b>	Subset-035 9.2.1.1 (9), 9.2.1.2 (9), 9.3.1.4c
<b>Packets transmitted via FFFIS STM</b>	Packet STM-5, STM-14, STM-15, STM-16
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
<b>Comments and constraints</b>	The testcase includes some test steps, that rely on the indication of the target speed on the DMI. The STM MAX speeds send to the ERTMS/ETCS on-board are defined as 180 km/h and 30 km/h. This requires an MRSP at the transition border of > 180 km/h defined as a V_LOA.



Starting Conditions	Value	Comments
STM State	CS	STM X in CS
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	Transitions only while moving (36 km/h)
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	STM shall not be isolated

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# ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-B A1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM) Time T1
2	STM reports state HS	PROF	T1 + 5 s	Message SA1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T1 + 7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	STM sends MAX Speed (180 km/h) to Control Function	PROF	T1 + 8 s	Message S1: STM-15 + 16 from STM	DMI	Ts4	STM MAX Speed shall be displayed as the current target speed
5	STM updates MAX Speed (30 km/h) to Control Function	PROF	T1 + 16 s	Message S2: STM-15+16 from STM	DMI	Ts4	new STM MAX Speed shall be displayed as the current target speed
6	ERTMS/ETCS Onboard applies the Service Brake	-	T1 + 16s	-	TIU	Ts24	Service Brake applied by ERTMS/ETCS Onboard
7	At the transition location: Mode and Level changes at transition border	BTM	T1 + 20 s	Telegram B1+B2: Transition order from BTM	PROF	5s	Message EC1 <ul style="list-style-type: none"> <li>- DA state order</li> <li>- Mode and Level to STM</li> </ul> Note: possible in one or two messages Time T2

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		-		-	DMI	5s	STM MAX Speed display shall be deleted from the DMI
8	STM sends state report to Control Function	PROF	T2 + 3 s	Message S3: STM-15 from STM	TIU	5s	Release of Service Brake due to STM MAX Speed

#### STM Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	STM receives HS state order	PROF	T0	Message ECA1	PROF	10 s	Report HS within 10 seconds Message SA1: STM-15
2	STM receives Mode and Level STM receives DA state order	PROF	T0+20 s	Message EC1: STM-5 and STM-14	PROF	5s	Message S3: STM-15

Telegram-BA1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction

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Telegram-BA1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order

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Telegram-BA1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-BA2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

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Message-ECA1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-SA1 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise

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Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC, specified by NID_STM X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group

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Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-S1: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	16	Transition variables STM max speed from STM (STM-16)
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	36	180 km/h
Padding bits	COMPUTED	NOT RELEVANT	

Message-S2: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)

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Message-S2: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	16	Transition variables STM max speed from STM (STM-16)
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	6	30 km/h
Padding bits	COMPUTED	NOT RELEVANT	

Message-S3: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	state DA
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	state DA
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length

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Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
M_LEVEL	3	1	Level NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
M_MODE	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	





End Conditions	Value	Comments
STM State	DA	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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### Test Case 3b.3

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3b.2.0.1.0.1
	Check the behaviour of the STM and the ERTMS/ETCS on-board after reception of level transition announcement (announced by balise group). This includes the transmission STM SYSTEM Speed and Distance and retransmission of STM SYSTEM Speed and Distance, including a Service Brake application by the ERTMS/ETCS on-board.
ERTMS/ETCS on-board requirements tested	Subset-035 8.6.1.3, 10.3.2.2 (A9), 10.3.2.4 (A9), 10.3.2.6, 10.5.1.1a, 10.12.1.4, 10.12.1.5
STM requirements tested	Subset-035 9.2.1.1 (9), 9.2.1.2 (9), 9.3.1.4c
Packets transmitted via FFFIS STM	Packet STM-5, STM-14, STM-15, STM-17
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
Comments and constraints	<p>The testcase includes some test steps, that rely on the indication of the target speed on the DMI. The STM SYSTEM speeds send to the ERTMS/ETCS on-board are defined as 170 km/h and 30 km/h. This requires an MRSP at the transition border of &gt; 170 km/h defined as a V_LOA.</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State	CS	STM X in CS
ETCS Mode	FS	
ETCS Level	1	ETCS Level 1
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	STM shall not be isolated

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# ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-BA1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM)
2	STM reports state HS, including a SYSTEM Speed and Distance to Control function	PROF	T0 + 5 s	Message S1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
	-	-	-	-	DMI	Ts5	new STM System Speed shall be included in the permitted speed
3	Driver acknowledges LTR	DMI	T0 + 7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	STM updates SYSTEM Speed and Distance to Control function	PROF	T0+18s	Message S2: STM-15 + 17 from STM	DMI	Ts5	new STM System Speed shall be included in the permitted speed
-	ERTMS/ETCS Onboard applies the Service Brake	-	-	-	TIU	Ts25	Service Brake applied by ERTMS/ETCS Onboard
5	At the transition location: Mode and Level changes at transition border	BTM	T0+20s	Telegram B1+B2: Transition order from BTM	PROF	5s	Message EC1 - DA state order - Mode and Level to STM Note: possible in one or two messages
-	STM System Speed supervision shall be stopped	-	T0+20s	-	DMI	5s	STM System Speed shall be deleted in the permitted speed
-	Service Brake shall be released	-	T0+20s	-	TIU	5s	Release of Service Brake due to STM System Speed and distance

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6	STM sends state report to Control Function	PROF	T0+23s	Message S3: STM-15 from STM	TIU	5s	No FA order from ERTMS/ETCS on-board
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#### STM Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	STM receives HS state order	PROF	T0	Message ECA1	PROF	10 s	Report HS within 10 seconds Message SA1: STM-15
2	STM receives Mode and Level STM receives DA state order	PROF	T0 + 20s	Message EC1: STM-5 and STM-14	PROF	5s	Report DA within 5 seconds Message S3: STM-15

BTM-Telegrams BA1, BA2 same definitions as in 3b.1  
Messages ECA1, S3 same definitions as in 3b.1

Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction

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Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC, specified by NID_STM X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-S1: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X

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Message-S1: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	17	Transition variables STM system speed and distance from STM (STM-17)
L_PACKET	13	COMPUTED	packet length
V_STMSYS	7	34	170 km/h
D_STMSYS	15	10	100 m
Padding bits	COMPUTED	NOT RELEVANT	

Message-S2: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	17	Transition variables STM system speed and distance from STM (STM-17)
L_PACKET	13	COMPUTED	packet length
V_STMSYS	7	6	30 km/h
D_STMSYS	15	10	100 m
Padding bits	COMPUTED	NOT RELEVANT	

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Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	state DA
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
M_MODE	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	





End Conditions	Value	Comments
STM State	DA	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3b.6

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3b.1.0.2.2.0
	Check the behaviour of the STM and the ERTMS/ETCS on-board after reception of level transition announcement (announced by balise group). This includes the transmission of MAX -Speed. STM does not answer DA state order
ERTMS/ETCS on-board requirements tested	Subset-035, 10.3.2.6, 10.3.2.2 (D16) , 10.3.2.4 (D16), 10.3.3.4, 10.3.3.8, 10.5.1.1a, 10.12.1.1, 10.12.2.1, 10.12.2.2
STM requirements tested	
Packets transmitted via FFFIS STM	Packet STM-5, STM-14, STM-15, STM-16
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
Comments and constraints	<p>The testcase includes some test steps, that rely on the indication of the target speed on the DMI. The STM MAX speeds send to the ERTMS/ETCS on-board are defined as 180 km/h and 60 km/h. This requires an MRSP at the transition border of &gt; 180 km/h defined as a V_LOA.</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State	CS	STM X in CS
ETCS Mode	FS	
ETCS Level	1	ETCS Level does not matter, 2,3 is equivalent
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	STM shall not be isolated

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# ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-B A1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM)
2	STM reports state HS	PROF	T0 + 5 s	Message SA1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T0 + 7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	STM sends MAX Speed to Control Function	PROF	T0 + 10 s	Message S1; STM-15 + 16 from STM	DMI	Ts4	STM MAX Speed shall be displayed as the current target speed
5	Mode and Level changes at transition border	BTM	T0 + 20 s	Telegram B1 + B2 from BTM	PROF	5s	Message EC1 <ul style="list-style-type: none"> <li>- DA state order</li> <li>- Mode and Level to STM</li> <li>-</li> </ul> Time T1 Note: possible in one or two messages
					DMI	5s	STM MAX Speed display shall be deleted from the DMI.
6	timeout DA state report	-	T1 + 5s	-	TIU	5s	safe action due to FA STM in Level NTC X area

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			T1 + 5s	-	PROF	5s	Message EC2 STM state order FA
-	STM becomes unavailable	-	T1 + 5 s	-	DMI	Ts21	Driver is informed about the unavailable STM

**STM Test Case**  
Not applicable

BTM-Telegrams BA1, BA2 same definitions as in 3b.1  
Messages ECA1, SA1 same definitions as in 3b.1

Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW

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Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
M_LEVELTR	3	1	Level NTC, specified by NID_NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-S1: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X

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Message-S1: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	16	Transition variables STM max speed from STM (STM-16)
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	36	180 km/h
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	state DA
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
M_MODESTM	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	

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Message-EC2 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	state FA
Padding bits	COMPUTED	NOT RELEVANT	





End Conditions	Value	Comments
STM State	FA	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3b.9

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3b.1.0.1.0.3.0.0
	Check the behaviour of the STM and the ERTMS/ETCS on-board after reception of level transition announcement (announced by balise group). This includes the transmission of STM MAX Speed and retransmission before transition. After transition, but before DA state report, driver manually changes the level to ETCS Level 0
ERTMS/ETCS on-board requirements tested	Subset-035 10.3.2.2 (k4a), 10.3.2.4 (k4a), 10.3.2.6, 10.3.3.1, 10.5.1.1a, 10.12.1.1, 10.12.1.2, 10.12.2.1, 10.12.2.3
STM requirements tested	
Packets transmitted via FFFIS STM	Packet STM-5, STM-14, STM-15, STM-16
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
Comments and constraints	<p>The testcase includes some test steps, that rely on the indication of the target speed on the DMI. The STM MAX speed send to the ERTMS/ETCS on-board is defined as 180 km/h and 60 km/h. This requires an MRSP/V_MAIN at the transition border of &gt; 180 km/h defined as a V_LOA.</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State	CS	STM X in CS
ETCS Mode	FS	
ETCS Level	1	ETCS Level 1
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	STM shall not be isolated

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# ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-BA1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM)
2	STM reports state HS	PROF	T0 + 5 s	Message SA1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T0 + 7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	STM sends MAX Speed to Control Function	PROF	T0 + 8 s	Message S1: STM-15 + 16 from STM	DMI	Ts4	STM MAX Speed shall be displayed as the current target speed
5	STM updates MAX Speed to Control Function	PROF	T0 + 10 s	Message S2: STM-15 + 16 from STM	DMI	Ts4	new STM MAX Speed shall be displayed as the current target speed
6	Train speed is reduced with target transition border	-	T0 + 11s	-	-	-	From 10 m/s to 0 m/s in 100 m: 20 seconds with 0.5 m/s <sup>2</sup>
7	At the transition location: Mode and Level changes at transition border	BTM	T0 + 30 s	Telegram B1+B2: Transition order from BTM	PROF	5s	Message EC1 <ul style="list-style-type: none"> <li>- DA state order</li> <li>- Mode and Level to STM</li> </ul> Time T1 Note: possible in one or two messages

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	-	-	-	-	DMI	5s	STM MAX Speed display shall be stopped
8	Train reaches standstill directly after the transition border	-	T0 + 31 s	-	ODO	1 s	Standstill signaled
9	Driver selects ETCS Level 0	DMI	T1 + 2s	-	PROF	5s	Message EC2 - Mode and Level to STM
10	STM sends state report to Control Function	PROF	T1 + 4s	Message S3: STM-15 from STM (DA)	PROF	Ts20	Message EC3 - State Order (CS) to STM - Time T2
11	STM sends state report to STM Control Function	PROF	T2 + 5s	Message S4: STM-15 from STM (CS)	PROF	5s	No FA state order sent to STM control function

#### STM Test Case

Not applicable

BTM-Telegrams BA1, BA2 same definitions as in 3b.1

Messages ECA1, SA1 same definitions as in 3b.1

Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates

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Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC, specified by NID_STM X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>

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Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-S1: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	16	Transition variables STM max speed from STM (STM-16)
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	36	180 km/h
Padding bits	COMPUTED	NOT RELEVANT	

Message-S2: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	16	Transition variables STM max speed from STM (STM-16)
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	12	60 km/h
Padding bits	COMPUTED	NOT RELEVANT	

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Message-S3: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	state DA
Padding bits	COMPUTED	NOT RELEVANT	

Message-S4: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	state CS
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC1 (state order + etcs status to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length

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Message-EC1 (state order + etcs status to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STMSTATEORDER	4	7	state DA
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
M_MODE	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC2 (etcs status to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	0	Level 0
M_MODE	4	4	UN (UNFITTED)
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC3 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length

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Message-EC3 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STMSTATEORDER	4	4	state CS
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM State	CS	
ETCS Mode	UN	
ETCS Level	0	
Train State	standstill	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3c.1

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3c.0.1.0.0
	Check the selection of correct NID_STM related to NID_NTC of the ETCS Onboard. An NTC is assigned to two different STM (X0 and X1), where STM X0 has the higher priority. From trackside, a packet 44 for NTC X0 is received. This shall select the STM X0 for NTC X0
ERTMS/ETCS on-board requirements tested	Subset-035 10.2.1.1, 10.2.1.2b, 10.3.2.2 (A6), 10.3.2.4 (A6), 10.3.2.6, 10.11.1.1, 10.11.1.2, 10.11.1.3
	SUBSET-026 <u>5.10.2.4.1 b)</u> , 3.15.6.5 (from BG)
STM requirements tested	Subset-035
Packets transmitted via FFFIS STM	Packet STM-14, STM-45
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X1 installed on-board</li> <li>- STM X2 installed on-board</li> <li>- STM Y not powered</li> <li>- STM X0 corresponds to NTC X0 by configured table (highest priority)</li> <li>- STM X1 corresponds to NTC X0 by configured table</li> <li>- STM X2 not corresponding to an NTC</li> </ul>

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	- STM Y corresponds to NTC Y by configured table
<b>Comments and constraints</b>	The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state HS when a level transition announcement to this STM is received using the association done through airgap data received Odometer speed shall be 36 km/h.



Starting Conditions	Value	Comments
STM State (STM X0)	CS	no STM in state HS or state DA
STM State (STM X1)	CS	no STM in state HS or state DA
STM State (STM X2)	CS	no STM in state HS or state DA
STM State (STM Y)	NP	
ETCS Mode	FS	
ETCS Level	1	ETCS Level does not matter, 2,3 is equivalent
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	

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Starting Conditions	Value	Comments
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC X1 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	Packet 44 indicating NID_NTC X0 for Level NTC X0 received	BTM	T0	Group-B1 (44- Data used outside ETCS)	PROF	Ts8	Message EC2 to STM X0 STM-45 containing the packet-44 data
2	Level Transition announcement for an ETCS -> NTC X0 transition: order announced STM to HS state	BTM	T0+20s	Group-B2 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order)	PROF	5s	STM X0 Control Connection: Message-EC1 (STM-14 - state order "HS" to STM)
3	Driver acknowledges LTR	DMI	T0 + 25 s	Ack by driver	PROF	5s	No FA state order sent to STM control function

#### STM Test Case

Not applicable

Telegram-B1-1: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink

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Telegram-B1-1: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	1111111b	Packet 255 – End of information

Telegram-B1-2: Balise-Information (Data used by applications outside the ERTMS/ETCS system)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	44	Packet 44 – Data used outside ETCS
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
NID_XUSER	9	102	NID_XUSER for STM
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X0
DATA	n x 8	FINITE VALUE	Data to be send to the STM

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Telegram-B1-2: Balise-Information (Data used by applications outside the ERTMS/ETCS system)			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile, Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction

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Telegram-B2-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X0 (same value NTC X0 used in Packet 44 of B1)
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

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Telegram-B2-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

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Message-EC2 (Airgap message for STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	45	ETCS airgap message for STM
L_PACKET	13	COMPUTED	packet length
D_ESTODO_BG	32	COMPUTED	Odometer Reading (estimated odometer reading of the location reference of the BG1)
N_L_ITER	8	COMPUTED	Number of bytes of ETCS Packet (Full ETCS packet 44)
NID_PACKET	8	44	Packet 44 – Data used outside ETCS
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
NID_XUSER	9	102	NID_XUSER for STM
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X0 (NTC X0 = STM X0)
DATA	n x 8	FINITE VALUE	Data to be send to the STM X
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X0 State	HS	
STM X1 State	CS	
STM X2 State	CS	
STM Y State	NP	
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	

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BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	unchanged	
NTC X1 Isolation Status	unchanged	
NTC Y Isolation Status	not relevant	



## Test Case 3c.2

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3c.0.2.0
	Check the selection of correct NID_STM related to NID_NTC of the ETCS Onboard when a transition announcement is received and NID_NTC value is inside the look up table: STM with highest priority is selected.
ERTMS/ETCS on-board requirements tested	Subset-035 10.2.1.1, 10.2.1.2a, 10.3.2.2 (A6), 10.3.2.4 (A6), 10.3.2.6
	SUBSET-026 <u>5.10.2.4.1 b)</u>
STM requirements tested	Subset-035
Packets transmitted via FFFIS STM	Packet STM-14
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X1 installed on-board</li> <li>- STM X2 installed on-board</li> <li>- STM Y not powered</li> <li>- STM X0 corresponds to NTC X0 by configured table (highest priority)</li> <li>- STM X1 corresponds to NTC X0 by configured table</li> <li>- STM X2 not correspond or associated to a NTC</li> <li>- STM Y corresponds to NTC Y by configured table</li> </ul>

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<b>Comments and constraints</b>	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state HS when a level transition announcement to this STM is received</p> <p>Odometer speed shall be 36 km/h.</p>
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Starting Conditions	Value	Comments
STM State (STM X0)	CS	no STM in state HS or state DA
STM State (STM X1)	CS	no STM in state HS or state DA
STM State (STM X2)	CS	no STM in state HS or state DA
STM State (STM Y)	NP	
ETCS Mode	FS	
ETCS Level	1	ETCS Level does not matter, 2,3 is equivalent
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	

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Starting Conditions	Value	Comments
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC X1 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC X0 transition: order announced STM to HS state	BTM	T0	Group-B1 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order)	PROF	5s	STM X0 Control Connection: Message-EC1 (STM-14 - state order "HS" to STM)
2	Driver acknowledges LTR	DMI	T0 + 5 s	Ack by driver	PROF	5s	No FA state order sent to STM control function

#### STM Test Case

Not applicable

Telegram-B1-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0

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Telegram-B1-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient

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Telegram-B1-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC X0
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B1-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group

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Telegram-B1-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X0 State	HS	
STM X1 State	CS	
STM X2 State	CS	
STM Y State	NP	
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	

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BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	unchanged	
NTC X1 Isolation Status	unchanged	
NTC Y Isolation Status	not relevant	

### Test Case 3c.3

TEST CASE HEADER	
<b>Test case identification</b>	Level Transitions ETCS->STM (CS -> HS -> DA)
	3c.0.3.0
	Check the selection of correct NID_STM related to NID_NTC of the ETCS Onboard when a transition announcement is received and no STM is available on-board for this NTC
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035 10.2.1.1, 10.2.1.2a, 10.12.1.3,
	SUBSET-026 <u>5.10.2.4.1 b)</u>
<b>STM requirements tested</b>	Subset-035
<b>Packets transmitted via FFFIS STM</b>	
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X1 installed on-board</li> <li>- STM X2 installed on-board</li> <li>- STM Y not powered</li> <li>- STM X0 corresponds to NTC X0 by configured table</li> <li>- STM X1 corresponds to NTC X0 by configured table</li> </ul>

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	<ul style="list-style-type: none"><li>- STM X2 not corresponds to an NTC</li><li>- STM Y corresponds to NTC Y by configured table</li></ul>
<b>Comments and constraints</b>	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) handles a transition target NTC correct, if it is not available (not powered) by setting the STM MAX SPEED to “0”, if there is no other transition target in the priority list given.</p> <p>Odometer speed shall be 36 km/h.</p>





Starting Conditions	Value	Comments
STM State (STM X0)	CS	no STM in state HS or state DA
STM State (STM X1)	CS	no STM in state HS or state DA
STM State (STM X2)	CS	
STM State (STM Y)	NP	
ETCS Mode	FS	
ETCS Level	1	ETCS Level does not matter, 2,3 is equivalent
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	

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Starting Conditions	Value	Comments
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC X1 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC Y transition:	BTM	T0	Group-B1 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order)	DMI	Ts3	Set STM MAX SPEED to "0",  STM MAX Speed shall be displayed as the current target speed Time T1

#### STM Test Case

Not applicable

Telegram-B1-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates

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Telegram-B1-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m

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Telegram-B1-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC Y
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	0	mixed level area: no
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B1-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	Unlinked

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Telegram-B1-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	11111111	Packet 255 – End of information



End Conditions	Value	Comments
STM X0 State	CS	
STM X1 State	CS	
STM X2 state	CS	
STM Y State	NP	no change for NP STM Y
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	

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BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	



## Test Case 3c.4

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3c.0.4.0
	<p>Check the selection of correct NID_STM related to NID_NTC of the ETCS Onboard.</p> <p>An NTC is not assigned to an STM, but the STM having the same NID_STM as the announced NTC shall be selected</p>
ERTMS/ETCS on-board requirements tested	Subset-035 10.2.1.1, 10.2.1.2a, 10.3.2.2 (A6), 10.3.2.4 (A6)
	SUBSET-026 <u>5.10.2.4.1 b)</u>
STM requirements tested	Subset-035
Packets transmitted via FFFIS STM	Packet STM-14
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X1 installed on-board</li> <li>- STM X2 installed on-board</li> <li>- STM Y not powered</li> <li>- STM X0 corresponds to NTC X0 by configured table (highest priority)</li> <li>- STM X1 corresponds to NTC X0 by configured table</li> <li>- STM X2 not corresponds to an NTC</li> </ul>

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	<ul style="list-style-type: none"><li>- STM Y corresponds to NTC Y by configured table</li></ul>
<b>Comments and constraints</b>	<p>The objective of this test is to check that when a level transition announcement is received to an NTC not included in the look up table, the ERTMS/ETCS on-board (STM Control Function) sends a transition order to state HS to the STM with NID_STM equal to the received NID_NTC</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State (STM X0)	CS	no STM in state HS or state DA
STM State (STM X1)	CS	no STM in state HS or state DA
STM State (STM X2)	CS	no STM in state HS or state DA
STM State (STM Y)	NP	
ETCS Mode	FS	
ETCS Level	1	ETCS Level does not matter, 2,3 is equivalent
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	

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Starting Conditions	Value	Comments
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC X1 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	Level Transition announcement for an ETCS -> NTC X2 transition: order announced STM to HS state	BTM	T0	Group-B2 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order)	PROF	5s	STM X2 Control Connection: Message-EC1 (STM-14 - state order "HS" to STM)
2	Driver acknowledges LTR	DMI	T0 + 5 s	Ack by driver	PROF	5s	No FA state order sent to STM control function

#### STM Test Case

Not applicable

Telegram-B2-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise

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Telegram-B2-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction

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Telegram-B2-1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC (same value NTC X2)
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates

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Telegram-B2-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X2
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X0 State	CS	
STM X1 State	CS	
STM X2 State	HS	
STM Y State	NP	
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	

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BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	unchanged	
NTC X1 Isolation Status	unchanged	
NTC Y Isolation Status	not relevant	





## Test Case 3d.1

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3d.0.0.0.0.0
	Check the selection of correct NID_STM related to NID_NTC of the ETCS Onboard By transition announcement by Baseline 2 track layout
ERTMS/ETCS on-board requirements tested	Subset-035 10.2.1.2a, 10.2.1.2c, 10.2.1.3, 10.3.2.2 (A6, B6, H4a, A17), 10.3.2.4 (A6, B6, H4a, A17), 10.3.2.6, 10.3.2.7 (H4a)
	SUBSET-026 <u>5.10.2.4.1 b)</u>
STM requirements tested	
Packets transmitted via FFFIS STM	Packet STM-5, STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X1 installed on-board</li> <li>- STM Y not powered</li> <li>- STM X0 (NID_STM X0) corresponds to NTC X0 by configured table (higher priority)</li> <li>- STM X1 (NID_STM X1) corresponds to NTC X0 by configured table</li> <li>- STM Y corresponds to NTC Y by configured table</li> </ul>
Comments and	The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the

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<b>constraints</b>	STM X0 to the state HS when a level transition announcement to the NTC X0 is received and, if the STM X0 reports failure, reassigns the STM X1 as STM for ETCS Level NTC X0, if Odometer speed shall be 36 km/h.
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Starting Conditions	Value	Comments
STM State (STM X0)	CS	no STM in state HS or state DA
STM State (STM X1)	CS	no STM in state HS or state DA
STM State (STM Y)	NP	
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	

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Starting Conditions	Value	Comments
NTC X0 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC X1 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC X0 transition: order announced STM to HS state	BTM	T0	Telegram-B1 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order) Telegram-B2	PROF	5s	STM X0 Control function: Message-EC1 (STM-14 - state order to STM)
2	STM X0 reports state HS	PROF	T0 + 8 s	Message S1 State Report from STM X0 STM-15 HS	-	-	-
3	Train decelerates and reaches standstill	DMI	T0 + 20 s	-	-	-	-

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Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
4	CAB is closed	TIU	T0 + 30 s	Driver closes desk	PROF	5 s	STM X0 Control function Message EC2 (STM-5, STM-14) ETCS Status (Mode SB) State Order (State CS)  STM X1 Control function Message EC3 (STM-5) ETCS Status (Mode SB)
5	STM X0 reports FA state and disconnects final	PROF	T0 + 36 s	Message S2 State Report from STM X0 STM-15 FA  Final disconnect STM X0 from STM Control function	-	-	-
6	CAB is opened	TIU	T0 + 40 s	Driver reopens desk and selects ETCS Level NTC X0	PROF	5s	STM X1 Control function Message EC4 (STM-14) State Order to HS
7	STM X1 reports state HS	PROF	T0 + 46 s	Message S3 State Report from STM X1 STM-15 HS	PROF	5s	No FA State Order to STM X1

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STM Test Case  
Not applicable

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0010000b	ETCS system version 1.0 (001 0000b → version 1.0 )
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	300	300 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC
NID_NTC	8	FINITE VALUE	value NID_NTC = NTC X0
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	0	No mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information

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VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0010000b	ETCS system version 1.0 (001 0000b → version 1.0 or 001 0001b → version 1.1)
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC2 (ETCS status and state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0

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Message-EC2 (ETCS status and state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	state CS
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	2	Level 1
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X0
M_MODE	4	6	SB (Stand By)
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC3 (ETCS status): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X1
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	2	Level 1
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X0
M_MODE	4	6	SB (Stand By)
Padding bits	COMPUTED	NOT RELEVANT	

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Message-EC4 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-S2 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0

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Message-S2 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	8	state FA
Padding bits	COMPUTED	NOT RELEVANT	

Message-S3 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X1
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X0 State	FA	
STM X1 State	HS	
STM Y State	unchanged	Only inside ETCS Onboard, since this STM is not connected
ETCS Mode	SN	
ETCS Level	NTC X0	
Train State	not relevant	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	

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BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	not isolated	
NTC X1 Isolation Status	not isolated	
NTC Y Isolation Status	not isolated	

## Test Case 3d.2

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3d.0.0.1.0.0
	Check the selection of correct NID_STM related to NID_NTC of the ETCS Onboard By transition announcement by Baseline 2 track layout
ERTMS/ETCS on-board requirements tested	Subset-035 10.2.1.2a, 10.2.1.2c, 10.2.1.3, 10.3.2.2 (A6, B6, H4a), 10.3.2.4 (A6, B6, H4a), 10.3.2.6, 10.3.2.7 (H4a)
	SUBSET-026 <u>5.10.2.4.1 b)</u>
STM requirements tested	
Packets transmitted via FFFIS STM	Packet STM-5, STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X1 installed on-board</li> <li>- STM Y not powered</li> </ul>

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	<ul style="list-style-type: none"><li>- STM X0 (NID_STM X0) corresponds to NTC X0 by configured table (higher priority)</li><li>- STM X1 (NID_STM X1) corresponds to NTC X0 by configured table</li><li>- STM Y corresponds to NTC Y by configured table</li></ul>
<b>Comments and constraints</b>	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM X1 to the state HS when a level transition announcement to the NTC X0 is received, if the STM X0 is isolated, selects the STM X1 as STM for ETCS Level NTC X0</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State (STM X0)	CS	no STM in state HS or state DA
STM State (STM X1)	CS	no STM in state HS or state DA
STM State (STM Y)	NP	
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	

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Starting Conditions	Value	Comments
NTC X0 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC X1 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC X0 transition: order announced STM to HS state	BTM	T0	Telegram-B1 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order) Telegram-B2	PROF	5s	STM X0 Control function: Message-EC1 (STM-14 - state order to STM)
2	STM X0 reports state HS	PROF	T0 + 8 s	Message S1 State Report from STM X0 STM-15 HS	-	-	-
3	Train decelerates and reaches standstill	DMI	T0 + 20 s	-	-	-	-

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Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
4	CAB is closed	TIU	T0 + 30 s	Driver closes desk	PROF	5 s	STM X0 Control function Message EC2 (STM-5, STM-14) ETCS Status (Mode SB) State Order (State CS)  STM X1 Control function Message EC3 (STM-5) ETCS Status (Mode SB)
5	STM X0 is isolated	PROF	T0 + 36 s	All functions are closed by the STM	-	-	-
		TIU	T0 + 36 s	ETCS receives STM X0-Isolation Signal	-	-	-
6	CAB is opened	TIU	T0 + 40 s	Driver reopens desk and selects ETCS Level NTC X0	PROF	5s	STM X1 Control function Message EC4 (STM-14) State Order to HS
7	STM X1 reports state HS	PROF	T0 + 46 s	Message S3 State Report from STM X1 STM-15 HS	PROF	5s	No FA State Order to STM X1

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STM Test Case  
Not applicable

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile, Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0010000b	ETCS system version 1.0 (001 0000b → version 1.0 )
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	300	300 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC
NID_NTC	8	FINITE VALUE	value NID_NTC = NTC X0
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	0	No mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

## Telegram-B2: Balise-Information

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VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0010000b	ETCS system version 1.0 (001 0000b → version 1.0 or 001 0001b → version 1.1)
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC2 (ETCS status and state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0

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Message-EC2 (ETCS status and state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	state CS
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	2	Level 1
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X0
M_MODE	4	6	SB (Stand By)
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC3 (ETCS status): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X1
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	2	Level 1
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X0
M_MODE	4	6	SB (Stand By)
Padding bits	COMPUTED	NOT RELEVANT	

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Message-EC4 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	



Message-S3 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X1
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X0 State	Not relevant	STM X= is isolated
STM X1 State	HS	
STM Y State	unchanged	Only inside ETCS Onboard, since this STM is not connected
ETCS Mode	SN	
ETCS Level	NTC X0	
Train State	not relevant	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	

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BIU Service Brake Status	not relevant	
STM X0 Isolation Status	isolated	
STM X1 Isolation Status	not isolated	
STM Y Isolation Status	not relevant	



## Test Case 3e.1

TEST CASE HEADER	
<b>Test case Identification</b>	Level Transitions ETCS->STM (CS -> HS -> DA)
	3e.0.0.1
	<i>Check ETCS-Onboard behaviour in case of an aborted Level transition</i>
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035 10.3.2.2 (A6, J4a), 10.3.2.4 (A6, J4a), 10.3.2.6, 10.3.2.7 (J4a), 10.12.1.6
<b>STM requirements tested</b>	Subset-035 9.2.1.1 (4a), 9.2.1.2 (4a)
<b>Packets transmitted via FFFIS STM</b>	Packet STM-14, STM-15
<b>ERTMS/ETCS on-board configuration</b>	- STM X installed on-board
	- STM X corresponds to NTC X0 by configured table
<b>Comments and constraints</b>	The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state CS when a level transition announcement to another ETCS Level is received Odometer speed shall be 36 km/h.



Starting Conditions	Value	Comments
STM State (STM X)	CS	
ETCS Mode	FS	
ETCS Level	1	ETCS Level 1
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	

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# ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-BA1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM)
2	STM reports state HS	PROF	T0 + 5 s	Message SA1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T0 + 7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	STM sends STM Max Speed	PROF	T0 + 8 s	Message S1: STM-16 from STM	DMI	Ts4	STM Max Speed is set as target speed for the level transition location (displayed as current target speed).
5	STM sends STM System Speed and Distance	PROF	T0 + 8 s	Message S2: STM-17 from STM	DMI	Ts5	STM System Speed shall be displayed as current permitted speed
6	Level Transition announcement for another ETCS transition: order STM X0 to CS state	BTM	T0 + 15 s	Telegram -B1 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order) Telegram-B2	PROF	1.5s	STM X0 Control Connection: Message-EC1 (STM-14 - state order to STM)
	Delete STM Max Speed				DMI	5s	STM Max Speed is deleted from the target speed calculation (target speed set to 200 km/h as defined in the MA)

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Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
	Delete STM System Speed and Distance				DMI	5s	STM System Speed and Distance is deleted from the MRSP calculation  (permitted speed set to 200 km/h as defined in the MA )
7	STM State report received	PROF	T0+18 s	Message S3: STM-15 from STM	PROF	5s	No FA order to STM received

#### STM Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	STM receives HS state order	PROF	T0	Message ECA1	PROF	10 s	Report HS within 10 seconds Message SA1: STM-15
2	STM state order CS received	PROF	T0 + 10s	Message EC1 – State Order to CS	PROF	10s	Message S3 STM state report CS (within 10 seconds)

BTM-Telegrams BA1, BA2 same definitions as in 3b.1  
Messages ECA1, SA1 same definitions as in 3b.1

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	40	200 km/h
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	2	Level 1
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B1-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0

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Telegram-B1-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	unconditional CS
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length

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Message-S1: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STMSTATE	4	6	state HS
NID_PACKET	8	16	Transition variables STM max speed from STM (STM-16)
L_PACKET	13	COMPUTED	packet length
V_STMMAX	7	36	180 km/h
Padding bits	COMPUTED	NOT RELEVANT	

Message-S2: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	17	Transition variables STM system speed and distance from STM (STM-17)
L_PACKET	13	COMPUTED	packet length
V_STMSYS	7	34	170 km/h
D_STMSYS	15	20	200 m
Padding bits	COMPUTED	NOT RELEVANT	

Message-S3 (state report from STM): STM Control Function → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X

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Message-S3 (state report from STM): STM Control Function → ETCS			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report to STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	CS
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X State	CS	Transition aborted
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3e.2

TEST CASE HEADER	
<b>Test case Identification</b>	Level Transitions ETCS->STM (CS -> HS -> DA)
	3e.0.2.0
	<i>Check ETCS-Onboard behaviour in case of an aborted Level transition</i>
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035, 10.3.2.2 (A6, J4a, C16), 10.3.2.4 (A6, J4a, C16) , 10.3.2.6, 10.3.2.7 (J4a), 10.12.1.6
<b>STM requirements tested</b>	
<b>Packets transmitted via FFFIS STM</b>	Packet STM-14
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X0 corresponds to NTC X0 by configured table</li> </ul>
<b>Comments and constraints</b>	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state CS when a level transition announcement to another NTC is received and also that the state FA is ordered, if the STM does not follow this order.</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State (STM X0)	CS	
ETCS Mode	FS	
ETCS Level	1	ETCS Level 1
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	

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Starting Conditions	Value	Comments
STM X0 Isolation Status	Not isolated	STM X0 shall not be isolated
STM X1 Isolation Status	not relevant	
STM Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-BA1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM)
2	STM reports state HS	PROF	T0 + 5 s	Message SA1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T0 + 7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	Level Transition announcement for another ETCS transition: order STM X0 to CS state	BTM	T0 + 10s	Telegram-B1 (12 - Level 1 Movement Authority, 21 - Gradient Profile, 27 - International Static Speed Profile, 41 - Level Transition Order) Telegram-B2	PROF	Ts9	STM X0 Control Connection: Message-EC1 (STM-14 - state order U-CS to STM) Time T1
5	STM does not report CS within 10 seconds	-	T1 + 10 s	-	prof	5s	Message-EC2 State order FA to STM

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# STM Test Case

Not applicable

BTM-Telegrams BA1, BA2 same definitions as in 3b.1

Messages ECA1, SA1 same definitions as in 3b.1

Telegram-B1-1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	2	Level 1
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

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Telegram-B1-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	unconditional CS
Padding bits	COMPUTED	NOT RELEVANT	

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Message-EC2 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	FA
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X0 State	FA	Transition aborted
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3f.1

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3f.0.1
	Driver select manual the ETCS Level NTC X. The related STM is already in CS.
ERTMS/ETCS on-board requirements tested	Subset-035 10.2.1.2c, 10.3.2.2 (A9) , 10.3.2.4 (A9), 10.3.2.6
STM requirements tested	Subset-035 9.2.1.1 (9), 9.2.1.2 (9), 9.3.1.4c
Packets transmitted via FFFIS STM	STM-14, STM-5, STM-15
ETCS configuration	NTC X is corresponds to the STM X0
Comments and constraints	The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state DA when a manual level transition to this STM is executed



Starting Conditions	Value	Comments
STM State (STM X0)	CS	
ETCS Mode	FS	
ETCS Level	1	ETCS Level does not matter, 2,3 is equivalent
Train State	standstill	manual transitions only while at standstill
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	not isolated	STM X0 shall not be isolated

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Starting Conditions	Value	Comments
NTC X1 Isolation Status	not relevant	
NTC Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Driver selects ETCS Level NTC X	DMI	T0	Selection by Driver: Manual Level change	PROF	5s	STM X0 Control Connection: Message-EC1 (STM-14 - state order "DA" to STM, STM-5) Time T1
2.	STM X0 reports new state DA in due time	PROF	T1+3s	Message S1: STM-15	PROF	5s	No FA order from ETCS

#### STM Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	STM state order DA received	PROF	T0	Message EC1 – State Order to DA	PROF	5s	Message S1 STM state report DA (within 5 seconds)

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0

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Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	DA
NID_PACKET	8	5	ETCS Mode and Level to STM
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC X0
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X0
M_MODE	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1 (state report from STM): STM Control Function → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report to STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	DA
Padding bits	COMPUTED	NOT RELEVANT	

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End Conditions	Value	Comments
STM X0 State	DA	STM X0 active
STM X1 State	unchanged	
STM Y State	unchanged	Only inside ETCS Onboard, since this STM is not connected
ETCS Mode	SN	
ETCS Level	NTC	
Train State	standstill	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Status	not relevant	

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BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	





## Test Case 3f.2

TEST CASE HEADER	
<b>Test case identification</b>	Level Transitions ETCS->STM (CS -> HS -> DA)
	3f.0.2
	<i>Check the behaviour of ETCS on-board, if STM does not report DA state in time.</i>
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035 10.2.1.2c, 10.3.2.2 (A9, D16), 10.3.2.4 (A9, D16), 10.3.2.6
<b>STM requirements tested</b>	Subset-035
<b>Packets transmitted via FFFIS STM</b>	STM-14, STM-5
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X0 corresponds to NTC X0 by configured table</li> </ul>
<b>Comments and constraints</b>	The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state DA when a manual level transition to this STM is executed and also that the state FA is ordered, if the STM does not follow this order.

Starting Conditions	Value	Comments
STM State (STM X0)	CS	
ETCS Mode	FS	
ETCS Level	1	ETCS Level does not matter, 2,3 is equivalent

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Starting Conditions	Value	Comments
Train State	standstill	manual transitions only while at standstill
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	Not isolated	STM X0, X1 shall not be isolated
NTC X1 Isolation Status	not relevant	
NTC Y Isolation Status	not relevant	

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#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Driver selects ETCS Level NTC X	DMI	T0	Selection by Driver: Manual Level change	PROF	5s	STM X0 Control Connection: Message-EC1 (STM-14 - state order "DA" to STM and STM-5) Time T1
2	STM does not report state DA within 5 seconds	-	T1 + 5 s	-	PROF	5s	STM X0 Control Connection: Message-EC2 (STM-14 - state order "FA" to STM)

#### STM Test Case

Not applicable

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	7	DA
NID_PACKET	8	5	ETCS Mode and Level to STM
L_PACKET	13	COMPUTED	packet length

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Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X0
M_MODE	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC2 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X0
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	FA
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X0 State	FA	transition not ok
ETCS Mode	SN	
ETCS Level	NTC	
Train State	standstill	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3g.1

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3g.0.0.1
	Check the correct behaviour, if STM connects to the functions TIU, BIU and DMI and closes them after CS order
ERTMS/ETCS on-board requirements tested	Subset-035 8.6.1.4, 11.1.1.1a, 11.1.1.1b, 11.1.1.1.1, 11.1.1.2, 11.1.1.3, 13.2.1.5
STM requirements tested	Subset-035
Packets transmitted via FFFIS STM	STM-1, STM-5, STM-14, STM-15, STM-32, STM-35, STM-38, STM-39, STM-43, STM-46, STM-136, STM-139, STM-141, STM-143
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
Comments and constraints	<p>The objective is to check, that ERTMS/ETCS on-board correctly sends the parameters and states of the opened function and open / close of connections is correctly handled by EVC.</p> <p>ETCS Level 0 shall be in the priority table.</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State (STM X)	CS	
ETCS Mode	FS	
ETCS Level	1	ETCS Level 1
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not connected	
Other DMI channel connections	not relevant	
TIU Connection	not connected	
BIU Connection	not connected	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	STM X shall not be isolated

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# ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-BA1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM)
2	STM reports state HS	PROF	T0+5 s	Message SA1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T0+7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	STM establishes connection to TIU function	PROF	T0+8s	Message ST1 (STM-1)	PROF	Ts10	Message EC1 Version info (STM-1) Train interface command configuration and Train interface inputs status/availability to STM STM-141 and STM-139
5	STM establishes connection to BIU function	PROF	T0+8s	Message SB1 (STM-1)	PROF	Ts11	Message EC2 Version info (STM-1) Emergency and service brake parameters and Brake interface emergency and service brake status/availability to STM STM-136 and STM-143
6	STM establishes connection to active DMI function and sends preliminary requests (button)	PROF	T0+8s	Message SD1 (STM-1) Message S1 (STM-15 / STM-32)	PROF	5s	Message EC5 Version info (STM-1) No FA state order sent to STM control function

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Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
7	STM sends preliminary requests (indicator)	PROF	T0+9s	Message S2 (STM-15 /STM-35)	PROF	5s	No FA state order sent to STM control function
8	STM sends preliminary requests (text message)	PROF	T0+10s	Message S3 (STM-15 /STM-38)	PROF	5s	No FA state order sent to STM control function
9	STM sends preliminary requests (delete text message)	PROF	T0+11s	Message S4 (STM-15 /STM-39)	PROF	5s	No FA state order sent to STM control function
10	STM sends preliminary requests (speed and distance supervision info)	PROF	T0+12s	Message S5 (STM-15 /STM-43)	PROF	5s	No FA state order sent to STM control function
11	STM sends preliminary requests (sound)	PROF	T0+13s	Message S6 (STM-15 /STM-46)	PROF	5s	No FA state order sent to STM control function
12	Brakes applied (by driver) and train reaches standstill	TIU	T0+20s	-	ODO	10 s	Train reaches standstill (Deceleration 0.5 m/s <sup>2</sup> )
13	Direction Controller change position	TIU	T0+35 s	direction controller position to "neutral"	PROF	5s	Message EC3 Train interface inputs status/availability to STM STM-139
14	Transition aborted (Driver manually selects ETCS Level 0)	DMI	T0+40s	-	PROF	5s	Message EC4, (STM-14 – order to CS, STM-5 with new Level/Mode)
15	STM closes all connections except STM Control function	PROF	T0+45s	Disconnect request by STM	PROF	5s	No FA state order sent to STM control function
16	STM reports CS	PROF	T0+47s	Message S7 (STM-15)	PROF	5s	No FA state order sent to STM control function

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# STM Test Case

Not applicable

BTM-Telegrams BA1, BA2 same definitions as in 3b.1

Messages ECA1, SA1 same definitions as in 3b.1

Message-EC1 (TIU status to STM): ETCS TIU Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	139	Train interface inputs status/availability to STM
L_PACKET	13	COMPUTED	packet length
M_TITR_C_STATUS	2	FINITE VALUE	Traction cut-off Status
M_TIDIR_STATUS	3	1 (forward)	Direction Controller Position
M_TICAB_STATUS	2	1 (A)	Cab Status
NID_PACKET	8	141	Train interface commands configuration to STM
L_PACKET	13	COMPUTED	packet length
M_TIRB_CMD_AVAIL	1	FINITE VALUE	Inhibit regenerative brake command availability
M_TIMSH_CMD_AVAIL	1	FINITE VALUE	Inhibit magnetic shoes brake command availability
M_TIEDCBEB_CMD_AVAIL	1	FINITE VALUE	Inhibit Eddy current brake for Emergency Brake command availability
M_TIEDCBSB_CMD_AVAIL	1	FINITE VALUE	Inhibit Eddy current brake for Service Brake command availability
M_TIPANTO_CMD_AVAIL	1	FINITE VALUE	Pantograph command availability
M_TIFLAP_CMD_AVAIL	1	FINITE VALUE	Air tightness command availability
M_TIMS_CMD_AVAIL	1	FINITE VALUE	Main switch/Circuit breaker command availability
M_TITR_C_CMD_AVAIL	1	FINITE VALUE	Traction cut-off command availability

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Message-EC1 (TIU status to STM): ETCS TIU Function → STM			
VARIABLE	Length	VALUE	COMMENTS
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC2 (BIU status to STM): ETCS BIU Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	136	Brake interface emergency and service brake status/availability to STM
L_PACKET	13	COMPUTED	packet length
M_BIEB_STATUS	2	FINITE VALUE	EB command status
M_BISB_STATUS	2	FINITE VALUE	SB command status / availability
NID_PACKET	8	143	emergency and service brake parameters to STM
L_PACKET	13	COMPUTED	packet length
T_EB_MAXDELAY	8	FINITE VALUE	Maximum emergency brake command issue time delay
T_SB_MAXDELAY	8	FINITE VALUE	Maximum service brake command issue time delay
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC3 (direction controller to STM): ETCS TIU Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	139	Train interface inputs status/availability to STM
L_PACKET	13	COMPUTED	packet length
M_TITR_C_STATUS	2	FINITE VALUE	Traction cut-off Status

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Message-EC3 (direction controller to STM): ETCS TIU Function → STM			
VARIABLE	Length	VALUE	COMMENTS
M_TIDIR_STATUS	3	2 (neutral)	Direction Controller Position (changed)
M_TICAB_STATUS	2	1 (A)	Cab Status
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC4 (STM state order / Mode and Level): ETCS → STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State Order
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	8	4	U-CS
NID_PACKET	8	5	ETCS Status Data
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	0	Level 0
M_MODESTM	4	4	UN
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC5 (version info to STM): ETCS → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
Padding bits	COMPUTED	NOT RELEVANT	

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Message-ST1: STM → ETCS TIU Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-SB1: STM → ETCS BIU Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-SD1: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info

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Message-SD1: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	32	Button Request
L_PACKET	13	COMPUTED	packet length
N_ITER	5	1	
NID_BUTTON	8	1	
NID_BUTPOS	5	1	
NID_ICON	8	0	
M_BUT_ATTRIB	10	1000000001b	Normal Button, white text, black background
L_CAPTION	6	2	
X_CAPTION	8	'A'	
X_CAPTION	8	'B'	
Padding bits	COMPUTED	NOT RELEVANT	

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Message-S2: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	35	Indicator request
L_PACKET	13	COMPUTED	packet length
N_ITER	5	1	
NID_INDICATOR	8	1	
NID_INDPOS	5	1	
NID_ICON	8	0	
M_IND_ATTRIB	10	1000000001b	Normal Indicator, white text, black background
L_CAPTION	6	2	
X_CAPTION	8	'A'	
X_CAPTION	8	'B'	
Padding bits	COMPUTED	NOT RELEVANT	

Message-S3: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	38	Text Message

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Message-S3: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
NID_XMESSAGE	8	1	
M_XATTRIBUTE	10	1000000001b	
Q_ACK	1	0	
L_TEXT	8	1	
X_TEXT	8	'A'	
Padding bits	COMPUTED	NOT RELEVANT	

Message-S4: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	39	Delete Text Message
L_PACKET	13	COMPUTED	packet length
NID_XMESSAGE	8	1	
Padding bits	COMPUTED	NOT RELEVANT	

Message-S5: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)

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Message-S5: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	43	Speed and distance supervision information
L_PACKET	13	COMPUTED	packet length
Q_SCALE	2	2	10m scale
V_PERMIT	10	10	10km/h
V_TARGET	7	10	10km/h
V_RELEASE	10	10	10km/h
V_INTERV	10	10	10km/h
D_TARGET	15	100	1000m
M_COLOUR_SP	3	1	grey
M_COLOUR_PS	3	1	grey
Q_DISPLAY_PS	2	1	hook only
M_COLOUR_TS	3	1	grey
Q_DISPLAY_TS	2	1	hook only
M_COLOUR_RS	3	1	grey
Q_DISPLAY_RS	2	1	digital indicator
M_COLOUR_IS	3	1	grey
Q_DISPLAY_IS	2	1	display with normal bar width
Q_DISPLAY_TD	2	1	digital indicator
Padding bits	COMPUTED	NOT RELEVANT	

Message-S6: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length

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Message-S6: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STMSTATE	4	6	state HS
NID_PACKET	8	46	Sound command
L_PACKET	13	COMPUTED	packet length
N_ITER	5	1	
NID_SOUND	8	0	unified DMI (no customized DMI configured onboard)
Q_SOUND	2	2	Continuous sound
N_ITER	5	1	
M_FREQ	8	4	128Hz
T_SOUND	8	10	1sec.
Padding bits	COMPUTED	NOT RELEVANT	

Message-S7: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	State CS



End Conditions	Value	Comments
STM X State	CS	
ETCS Mode	UN	
ETCS Level	0	
Train State	standstill	
ETCS Train Data	unchanged	
Active DMI channel connection	connected	
Other DMI channel connections	not relevant	
TIU Connection	connected	
BIU Connection	connected	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	neutral	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3g.2

TEST CASE HEADER	
<b>Test case identification</b>	Level Transitions ETCS->STM (CS -> HS -> DA)
	3g.0.0.2
	Check the correct behaviour, if STM connects to the functions TIU, BIU and DMI and keeps them open after CS order
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035 8.6.1.4, 11.1.1.1a, 11.1.1.1b, 11.1.1.1.1, 11.1.1.2, 11.1.1.3, 13.2.1.5
<b>STM requirements tested</b>	Subset-035
<b>Packets transmitted via FFFIS STM</b>	STM-1, STM-5, STM-14, STM-15, STM-32, STM-35, STM-38, STM-39, STM-43, STM-46, STM-136, STM-139, STM-141, STM-143
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X0 corresponds to NTC X0 by configured table</li> </ul>
<b>Comments and constraints</b>	<p>The objective is to check, that ERTMS/ETCS on-board correctly sends the parameters and states of the opened function and open / close of connections is correctly handled by EVC</p> <p>ETCS Level 0 shall be in the priority table.</p>



Starting Conditions	Value	Comments
STM State (STM X)	CS	
ETCS Mode	FS	
ETCS Level	1	ETCS Level 1
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not connected	
Other DMI channel connections	not relevant	
TIU Connection	not connected	
BIU Connection	not connected	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	STM X shall not be isolated

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# ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-BA1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM)
2	STM reports state HS	PROF	T0+5 s	Message SA1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T0+7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	STM establishes connection to TIU function	PROF	T0+8s	Message ST1 with version info (STM - 1)	PROF	Ts10	Message EC1 Version info STM-1 Train interface commands configuration and Train Interface inputs status/availability to STM STM-141 and STM-139
5	STM establishes connection to BIU function	PROF	T0+8s	Message SB1 with version info (STM - 1)	PROF	Ts11	Message EC2 Version info STM-1 Emergency and service brake parameters and Brake interface emergency and service brake status/availability to STM STM-136 and STM-143
6	STM establishes connection to active DMI function and sends preliminary requests (button)	PROF	T0+8s	Message SD1 (STM-1) Message S1 (STM-15 / STM-32)	PROF	5s	Message EC5 Version info STM-1 No FA state order sent to STM control function

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Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
7	STM sends preliminary requests (indicator)	PROF	T0+9s	Message S2 (STM-15 /STM-35)	PROF	5s	No FA state order sent to STM control function
8	STM sends preliminary requests (text message)	PROF	T0+10s	Message S3 (STM-15 /STM-38)	PROF	5s	No FA state order sent to STM control function
9	STM sends preliminary requests (delete text)	PROF	T0+11s	Message S4 (STM-15 /STM-39)	PROF	5s	No FA state order sent to STM control function
10	STM sends preliminary requests (speed and distance)	PROF	T0+12s	Message S5 (STM-15 /STM-43)	PROF	5s	No FA state order sent to STM control function
11	STM sends preliminary requests (sound)	PROF	T0+13s	Message S6 (STM-15 /STM-46)	PROF	5s	No FA state order sent to STM control function
12	Brakes applied (by driver) and train reaches standstill	-	T0+20s	-	ODO	10s	Train reaches standstill (Deceleration 0.5 m/s <sup>2</sup> )
13	Direction Controller change position	TIU	T0+35s	direction controller position to "neutral"	PROF	5s	Message EC3 Train interface inputs status/availability to STM STM-139
14	Transition aborted (Driver manually selects ETCS Level 0)	DMI	T0+40s	-	PROF	5s	Message EC4, (STM-14 – order to CS, STM-5 with new Level/Mode)
15	STM reports CS	PROF	T0+45s	Message S7 (STM-15)	PROF	5s	No FA state order sent to STM control function
16	Direction Controller change position	TIU	T0+50s	direction controller position to "forward"	PROF	5s	Message EC6 Train interface inputs status/availability to STM STM-139

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# STM Test Case

Not applicable

BTM-Telegrams BA1, BA2 same definitions as in 3b.1

Messages ECA1, SA1 same definitions as in 3b.1

Message-EC1 (TIU status to STM): ETCS TIU Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	139	Train interface inputs status/availability to STM
L_PACKET	13	COMPUTED	packet length
M_TITR_C_STATUS	2	FINITE VALUE	Traction cut-off Status
M_TIDIR_STATUS	3	1 (forward)	Direction Controller Position
M_TICAB_STATUS	2	1 (A)	Cab Status
NID_PACKET	8	141	Train interface command configuration to STM
L_PACKET	13	COMPUTED	packet length
M_TIRB_CMD_AVAIL	1	FINITE VALUE	Inhibit regenerative brake command availability
M_TIMSH_CMD_AVAIL	1	FINITE VALUE	Inhibit magnetic shoes brake command availability
M_TIEDCBEB_CMD_AVAIL	1	FINITE VALUE	Inhibit Eddy current brake for Emergency Brake command availability
M_TIEDCBSB_CMD_AVAIL	1	FINITE VALUE	Inhibit Eddy current brake for Service Brake command availability
M_TIPANTO_CMD_AVAIL	1	FINITE VALUE	Pantograph command availability
M_TIFLAP_CMD_AVAIL	1	FINITE VALUE	Air tightness command availability
M_TIMS_CMD_AVAIL	1	FINITE VALUE	Main switch/Circuit breaker command availability
M_TITR_C_CMD_AVAIL	1	FINITE VALUE	Traction cut-off command availability

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Message-EC1 (TIU status to STM): ETCS TIU Function → STM			
VARIABLE	Length	VALUE	COMMENTS
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC2 (BIU status to STM): ETCS BIU Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	136	Brake interface emergency and service brake status/availability to STM
L_PACKET	13	COMPUTED	packet length
M_BIEB_STATUS	2	FINITE VALUE	EB command status
M_BISB_STATUS	2	FINITE VALUE	SB command status / availability
NID_PACKET	8	143	emergency and service brake parameters to STM
L_PACKET	13	COMPUTED	packet length
T_EB_MAXDELAY	8	FINITE VALUE	Maximum emergency brake command issue time delay
T_SB_MAXDELAY	8	FINITE VALUE	Maximum service brake command issue time delay
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC3 (direction controller to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	139	Train interface inputs status/availability to STM
L_PACKET	13	COMPUTED	packet length
M_TITR_C_STATUS	2	FINITE VALUE	Traction cut-off Status

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Message-EC3 (direction controller to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
M_TIDIR_STATUS	3	2 (neutral)	Direction Controller Position (changed)
M_TICAB_STATUS	2	1 (A)	Cab Status
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC4 (STM state order / Mode and Level): ETCS → STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	8	4	U-CS
NID_PACKET	8	5	
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	0	Level 0
M_MODESTM	4	4	UN
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC5 (Version info to STM): ETCS DMI Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
Padding bits	COMPUTED	NOT RELEVANT	

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Message-EC6 (direction controller to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	139	Train interface inputs status/availability to STM
L_PACKET	13	COMPUTED	packet length
M_TITR_C_STATUS	2	FINITE VALUE	Traction cut-off Status
M_TIDIR_STATUS	3	1 (forward)	Direction Controller Position (changed)
M_TICAB_STATUS	2	1 (A)	Cab Status
Padding bits	COMPUTED	NOT RELEVANT	

Message-ST1: STM → ETCS TIU Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-SB1: STM → ETCS BIU Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length

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Message-SB1: STM → ETCS BIU Function			
VARIABLE	Length	VALUE	COMMENTS
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-SD1: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	1	Version info
L_PACKET	13	COMPUTED	packet length
N_VERMAJOR	8	4	Version Major
N_VERMINOR	8	0	Version Minor
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS

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Message-S1: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	32	Button Request
L_PACKET	13	COMPUTED	packet length
N_ITER	5	1	
NID_BUTTON	8	1	
NID_BUTPOS	5	1	
NID_ICON	8	0	
M_BUT_ATTRIB	10	1000000001b	Normal Button, white text, black background
L_CAPTION	6	2	
X_CAPTION	8	'A'	
X_CAPTION	8	'B'	
Padding bits	COMPUTED	NOT RELEVANT	

Message-S2: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	35	Indicator request
L_PACKET	13	COMPUTED	packet length
N_ITER	5	1	
NID_INDICATOR	8	1	
NID_INDPOS	5	1	
NID_ICON	8	0	
M_IND_ATTRIB	10	1000000001b	Normal Indicator, white text, black background
L_CAPTION	6	2	

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Message-S2: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
X_CAPTION	8	'A'	
X_CAPTION	8	'B'	
Padding bits	COMPUTED	NOT RELEVANT	

Message-S3: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	38	Text Message
L_PACKET	13	COMPUTED	packet length
NID_XMESSAGE	8	1	
M_XATTRIBUTE	10	1000000001b	
Q_ACK	1	0	
L_TEXT	8	1	
X_TEXT	8	'A'	
Padding bits	COMPUTED	NOT RELEVANT	

Message-S4: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)

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Message-S4: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	39	Delete Text Message
L_PACKET	13	COMPUTED	packet length
NID_XMESSAGE	8	1	
Padding bits	COMPUTED	NOT RELEVANT	

Message-S5: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	43	Speed and distance supervision information
L_PACKET	13	COMPUTED	packet length
Q_SCALE	2	2	10m scale
V_PERMIT	10	10	10km/h
V_TARGET	7	10	10km/h
V_RELEASE	10	10	10km/h
V_INTERV	10	10	10km/h
D_TARGET	15	100	1000m
M_COLOUR_SP	3	1	grey
M_COLOUR_PS	3	1	grey
Q_DISPLAY_PS	2	1	hook only
M_COLOUR_TS	3	1	grey
Q_DISPLAY_TS	2	1	hook only

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Message-S5: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
M_COLOUR_RS	3	1	grey
Q_DISPLAY_RS	2	1	digital indicator
M_COLOUR_IS	3	1	grey
Q_DISPLAY_IS	2	1	display with normal bar width
Q_DISPLAY_TD	2	1	digital indicator
Padding bits	COMPUTED	NOT RELEVANT	

Message-S6: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	state HS
NID_PACKET	8	46	Sound command
L_PACKET	13	COMPUTED	packet length
N_ITER	5	1	
NID_SOUND	8	0	unified DMI (no customized DMI configured onboard)
Q_SOUND	2	2	Continuous sound
N_ITER	5	1	
M_FREQ	8	4	128Hz
T_SOUND	8	10	1sec.
Padding bits	COMPUTED	NOT RELEVANT	

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Message-S7: STM → ETCS DMI Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	State CS



End Conditions	Value	Comments
STM X0 State	CS	not changed
STM X1 State	unchanged	
STM Y State	unchanged	Only inside ETCS Onboard, since this STM is not connected
ETCS Mode	UN	
ETCS Level	0	
Train State	standstill	
ETCS Train Data	unchanged	
Active DMI channel connection	unchanged	
Other DMI channel connections	not relevant	
TIU Connection	unchanged	
BIU Connection	unchanged	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	neutral	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	

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BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

### Test Case 3h.1

TEST CASE HEADER	
<b>Test case identification</b>	Level Transitions ETCS->STM (CS -> HS -> DA)
	3h.1.0
	<i>Check ETCS-Onboard behaviour in case of Level Transition aborted by operational rules (SB)</i>
<b>ERTMS/ETCS on-board requirements tested</b>	Subset-035 10.3.2.2 (E4a), 10.3.2.4 (E4a), 10.3.2.6, 10.3.2.7 (E4a)
<b>STM requirements tested</b>	
<b>Packets transmitted via FFFIS STM</b>	Packet STM-5, STM-14, STM-15
<b>ERTMS/ETCS on-board configuration</b>	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X0 corresponds to NTC X0 by configured table</li> </ul>
<b>Comments and constraints</b>	The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state CS when a Mode change to SB is received



Starting Conditions	Value	Comments
STM State (STM X0)	CS	
ETCS Mode	FS	
ETCS Level	1	ETCS Level 1
Train State	Moving with 36 km/h	Transition only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	not relevant	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	Not isolated	
NTC X1 Isolation Status	not relevant	

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Starting Conditions	Value	Comments
NTC Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-BA1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM)
2	STM reports state HS	PROF	T0 +5 s	Message SA1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T0+7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	Train to standstill	Driver	T0+10 s	Driver reduces train speed to standstill before reaching the transition border	ODO	10s	Deceleration with 1.0 m/s <sup>2</sup> Standstill reached after 10 s (50 m)
5	Cab is closed. ETCS ordered to SB	TIU	T0+25s	Driver closes desk	PROF	Ts9	STM X Control Connection: Message-EC1 (STM-14 - state order "U-CS" to STM, STM-5 to STM) Time T1
6	STM state report CS	PROF	T1 + 2 s	STM Message S1 to ETCS STM15 - State report (State CS)	PROF	5s	No FA state order sent to STM control function

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# STM Test Case

Not applicable

BTM-Telegrams BA1, BA2 same definitions as in 3b.1

Messages ECA1, SA1 same definitions as in 3b.1

Message-EC1 (state order toSTM): STM Control Function → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	4	Unconditional CS
NID_PACKET	8	5	ETCS Status to STM (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	2	Level 1
M_MODE	4	6	SB (Stand By)
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length

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Message-S1 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STMSTATE	4	4	state CS
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X0 State	CS	Transition aborted
ETCS Mode	SB	StandBy
ETCS Level	1	
Train State	unchanged	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	not relevant	
TIU Cab Status (Desk Status)	No cab active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3h.2

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3h.2.0
	<i>Check ETCS-Onboard behaviour in case of Level Transition aborted by operational rules (UN )</i>
ERTMS/ETCS on-board requirements tested	Subset-035 10.3.2.2 ( G4a) , 10.3.2.4 (G4a), 10.3.2.6, 10.3.2.7 (G4a)
STM requirements tested	
Packets transmitted via FFFIS STM	Packet STM-5, STM-14, STM-15
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X0 installed on-board</li> <li>- STM X0 corresponds to NTC X0 by configured table</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) orders the STM to the state CS when a Level transition is aborted by a manual level change to ETCS Level 0 is received.</p> <p>ETCS Level 0 shall be in the priority table.</p> <p>Odometer speed shall be 36 km/h.</p>



Starting Conditions	Value	Comments
STM State (STM X0)	CS	
ETCS Mode	FS	
ETCS Level	1	ETCS Level 1
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	no cab active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X0 Isolation Status	Not isolated	
NTC X1 Isolation Status	not relevant	

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Starting Conditions	Value	Comments
NTC Y Isolation Status	not relevant	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for an ETCS -> NTC transition: order announced STM to HS state	BTM	T0	Telegram-BA1 + BA2 from BTM	PROF	1.5s	STM Control Connection: Message-ECA1 (STM-14 - state order to STM)
2	STM reports state HS	PROF	T0 + 5 s	Message SA1: STM-15 from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T0 + 7 s	Ack by driver	PROF	5s	No FA state order sent to STM control function
4	Train to standstill	Driver	T0+10 s	Driver reduces train speed to standstill before reaching the transition border	ODO	10s	Deceleration with 1.0 m/s <sup>2</sup> Standstill reached after 10 s (50 m)
5	Driver selects ETCS Level 0 ETCS Mode changes to UN	DMI	T0+25s	Driver selection of level	PROF	Ts9	STM X Control Connection: Message-EC1 (STM-14 - state order to STM, STM-5 to STM) Time T1
6	STM state report CS	PROF	T1 + 2 s	STM Message S1 to ETCS STM15 - State report (State CS)	PROF	5s	No FA state order sent to STM control function

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# STM Test Case

Not applicable

BTM-Telegrams BA1, BA2 same definitions as in 3b.1

Messages ECA1, SA1 same definitions as in 3b.1

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	12	Packet 12 - Level 1 Movement Authority
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
V_MAIN	7	0	0 → RED SIGNAL
V_LOA	7	40	200 km/h
T_LOA	10	1023	no time out
N_ITER	5	0	only one section
L_ENDSECTION	15	32767	327.670 km
Q_SECTIONTIMER	1	0	
Q_ENDTIMER	1	0	
Q_DANGERPOINT	1	0	
Q_OVERLAP	1	0	

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	21	Packet 21 – Gradient Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_GRADIENT	15	0	0 m
Q_GDIR	1	0	Downhill
G_A	8	0	0‰
N_ITER	5	0	only one gradient
NID_PACKET	8	27	Packet 27 – International Static Speed Profile
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	2	10 m
D_STATIC	15	0	0 m
V_STATIC	7	40	200 km/h
Q_FRONT	1	1	no train length delay
N_ITER	5	0	
N_ITER	5	0	
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC, specified by NID_NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	1	mixed level area
M_LEVELTR	3	0	Level 0
L_ACKLEVELTR	15	200	acknowledgement area

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order toSTM): STM Control Function → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	U-CS
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	0	Level 0
M_MODE	4	7	2 (UN)

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Message-EC1 (state order to STM): STM Control Function → ETCS			
VARIABLE	Length	VALUE	COMMENTS
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1 (state report from STM): STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	4	state CS
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM X0 State	CS	Transition aborted
ETCS Mode	UN	Unfitted
ETCS Level	0	
Train State	not relevant	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3i.1

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3i.0.0
	Check the behaviour of the ERTMS/ETCS on-board after reception of level transition order to an STM, that is installed on-board, but not available (STM state is PO, CO or DE)
ERTMS/ETCS on-board requirements tested	Subset-035 10.3.2.2 (I16), 10.3.2.4 (I16), 10.3.2.6, 10.3.3.4, 10.3.3.8, 10.14.1.1
STM requirements tested	Subset-035 9.2.1.1 (16), 9.2.1.2 (16)
Packets transmitted via FFFIS STM	Packet STM-5, STM-14, STM-15,
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> </ul>
Comments and constraints	Odometer speed shall be 36 km/h.
	ETCS Onboard is setting the STM MAX Speed to "0", but this is not relevant for this test. The train does not brake.



Starting Conditions	Value	Comments
STM State	CO	STM X in CO, Transition announced in 200 m
ETCS Mode	FS	
ETCS Level	1	ETCS Level does not matter, 2,3 is equivalent
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	

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Starting Conditions	Value	Comments
NTC X Isolation Status	Not isolated	STM shall not be isolated

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Train is moving at 36 km/h	-	T0	-	-	-	-
		-	T0	-	DMI	-	STM Max Speed "0" is supervised and visible on the DMI (due to "not available STM")
2	At the transition location: Mode and Level changes at transition border	BTM	T0+20s	Telegram B1+B2: Transition order from BTM	PROF	5s	Message EC1 - FA state order - Mode and Level to STM Time T1 Note: possible in one or two messages
-	ETCS considers the STM in FA state (H16)	-	-	STM is considered to be in FA due to H16	DMI	Ts23	Driver is informed about the failed STM
-	Safe Action is applied	-	-	-	TIU	5 s	ETCS Onboard applies the brake
3	STM sends FA state report to Control Function	PROF	T1 + 1s	Message S1: STM-15 from STM	-	-	-
4	Driver acknowledges STM failure message	DMI	T1 + 10 s	-	DMI	Ts22	Driver is informed about the unavailable STM

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#### STM Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Train is moving at 36 km/h	-	T0	-	-	-	-
2	STM receives Mode and Level STM receives FA state order	PROF	T0+20s	Message EC1: STM-5 and STM-14	PROF	5s	STM reports FA state to Control Function (optional)

Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC, specified by NID_STM X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
L_ACKLEVELTR	15	200	acknowledgement area

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Telegram-B1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_ITER	5	0	No mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-S1: STM → ETCS STM Control Function			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report from STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	8	state FA
Padding bits	COMPUTED	NOT RELEVANT	

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Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	8	state FA
NID_PACKET	8	5	ETCS status data (STM-5)
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	Level NTC
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X
M_MODE	4	13	SN (STM National)
Padding bits	COMPUTED	NOT RELEVANT	



End Conditions	Value	Comments
STM State	FA	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	not relevant	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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## Test Case 3j.1

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM (CS -> HS -> DA)
	3j.0.0.0.0
	<i>Check ETCS-Onboard behaviour in case of an Level transition</i>
ERTMS/ETCS on-board requirements tested	Subset-035 10.1.1.2, 10.1.1.3, 10.2.1.2a, 10.3.2.2 (A6, A9), 10.3.2.4 (A6, A9), 10.3.2.6, 10.5.1.1
	SUBSET-026 <u>5.10.2.4.1 b)</u>
STM requirements tested	Subset-035 9.2.1.1 (6,9), 9.2.1.2 (6,9), 9.3.1.4c
Packets transmitted via FFFIS STM	Packet STM-14, STM-15, STM-5
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X, Y, Z installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> <li>- STM Y corresponds to NTC Y by configured table</li> <li>- STM Z corresponds to NTC Z by configured table</li> </ul>
Comments and constraints	<p>The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) correctly hosts a list of STM “available for use”</p> <p>Odometer speed shall be 36 km/h.</p>





Starting Conditions	Value	Comments
STM State (STM X)	CS	
STM State (STM Y)	CS	
STM State (STM Z)	CO	Not CS, HS, DA
ETCS Mode	FS	
ETCS Level	1	ETCS Level does not matter, 2,3 is equivalent
Train State	Moving	Transitions only while moving
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	

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Starting Conditions	Value	Comments
BIU Service Brake Status	not relevant	
NTC X Isolation Status	Not isolated	
NTC Y Isolation Status	Not isolated	
NTC Z Isolation Status	Not isolated	

#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	Level Transition announcement for ETCS transition: - NTC Z - NTC X - NTC Y order STM X to HS state	BTM	T0	BTM-Message -B1 (Level Transition Order)	PROF	Ts9	STM X Control Connection: Message-EC1 (STM-14 - state order to STM) Time T1
2	STM State (STM X) report HS	PROF	T1 + 5s	Message S1 – STM state report from STM	PROF	5s	No FA state order sent to STM control function
3	Driver acknowledges LTR	DMI	T1 + 7 s	Ack by driver	-	-	-
4	Level Transition from trackside Transition to ETCS Level - NTC Z - NTC X - NTC Y	BTM	T0+20s	BTM-Message –B2 (41 - Level Transition Order)	PROF	5s	STM X Control Connection: Message-EC2 (STM-14 - state order to STM, STM-5 with ETCS State) Time T3
5	STM State (STM X) report DA	PROF	T3 + 2s	Message S1 – STM state report from STM	PROF	5s	No FA state order sent to STM control function

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#### STM Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time Interval	Output action
1	STM X receives state order to HS	PROF	T0	Reception of State Order to HS	PROF	10 s	Message S1 – STM State Report HS to ETCS
2	STM X receives state order to DA ETCS	PROF	T0+20s	Reception of State Order to DA	PROF	5 s	Message S2 – STM State Report DA to ETCS

Telegram-B1-1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	200	200 m
M_LEVELTR	3	1	Level NTC
NID_NTC	8	FINITE VALUE	NTC Z
L_ACKLEVELTR	15	200	acknowledgement area

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Telegram-B1-1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_ITER	5	2	mixed level area: Two more levels
M_LEVELTR	3	1	Level NTC
NID_NTC	8	FINITE VALUE	NTC X
L_ACKLEVELTR	15	200	acknowledgement area
M_LEVELTR	3	1	Level NTC
NID_NTC	8	FINITE VALUE	NTC Y
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B1-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2-1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise

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Telegram-B2-1: Balise-Information (Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	<b>0</b>	<b>Unlinked</b>
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC
NID_NTC	8	FINITE VALUE	NTC Z
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	2	mixed level area: Two more levels
M_LEVELTR	3	1	Level NTC
NID_NTC	8	FINITE VALUE	NTC X
L_ACKLEVELTR	15	200	acknowledgement area
M_LEVELTR	3	1	Level NTC
NID_NTC	8	FINITE VALUE	NTC Y
L_ACKLEVELTR	15	200	acknowledgement area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise

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Telegram-B2-2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information

Message-EC1 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATEORDER	4	6	HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-EC2 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	14	State order to STM (STM-14)
L_PACKET	13	COMPUTED	packet length

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Message-EC2 (state order to STM): ETCS STM Control Function → STM			
VARIABLE	Length	VALUE	COMMENTS
NID_STMSTATEORDER	4	7	DA
NID_PACKET	8	5	ETCS State to STM
L_PACKET	13	COMPUTED	packet length
M_LEVEL	3	1	NTC
NID_NTC	8	FINITE VALUE	NTC X
M_MODESTM	4	13	SN
Padding bits	COMPUTED	NOT RELEVANT	

Message-S1 (state report from STM): STM Control Function → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length
NID_PACKET	8	15	State report to STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	6	HS
Padding bits	COMPUTED	NOT RELEVANT	

Message-S2 (state report from STM): STM Control Function → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_STM	8	FINITE VALUE	Valid value for NID_STM X
L_MESSAGE	8	COMPUTED	message length

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Message-S2 (state report from STM): STM Control Function → ETCS			
VARIABLE	Length	VALUE	COMMENTS
NID_PACKET	8	15	State report to STM (STM-15)
L_PACKET	13	COMPUTED	packet length
NID_STMSTATE	4	7	DA
Padding bits	COMPUTED	NOT RELEVANT	





End Conditions	Value	Comments
STM State (STM X)	DA	
STM Y State	CS	
STM Z State	CO	Not CS, HS, DA
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	

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BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	
NTC Y Isolation Status	not isolated	
NTC Z Isolation Status	not isolated	

### Test Case 3k.1

TEST CASE HEADER	
Test case identification	Level Transitions ETCS->STM
	3k.0.0
	ETCS Level Transition without announcement, STM is not powered
ERTMS/ETCS on-board requirements tested	Subset-035 10.1.1.1, 10.3.3.4, 10.3.3.8
STM requirements tested	
Packets transmitted via FFFIS STM	
ERTMS/ETCS on-board configuration	<ul style="list-style-type: none"> <li>- STM X installed on-board</li> <li>- STM X corresponds to NTC X by configured table</li> <li>- STM is not powered</li> </ul>
Comments and	The objective of this test is to check that the ERTMS/ETCS on-board (STM Control Function) commands

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**constraints**

the emergency brake, when a level transition to this STM is received (without announcement).  
Odometer speed shall be 36 km/h.



Starting Conditions	Value	Comments
STM State	NP	Not powered
ETCS Mode	FS	
ETCS Level	1	
Train State	Moving	
ETCS Train Data	valid	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Emergency Brake Command	EB not commanded	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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#### ERTMS/ETCS on-board Test Case

Step	Description/Comments	Input I/F	Input Time	Input Action	Output I/F	Output Time limit	Output action
1	Level Transition for an ETCS -> NTC X transition	BTM	T0	Telegram-B1 (41 - Level Transition Order) Telegram-B2	TIU	5s	Emergency Brake Commanded
-	the driver shall be informed about the unavailable STM	-	T0	-	DMI	Ts21	Driver is informed, that the STM is not available

#### STM Test Case

Not applicable

Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile. Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	0	1 <sup>st</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	Unlinked
NID_PACKET	8	41	Packet 41 – Level Transition Order
Q_DIR	2	1	nominal direction
L_PACKET	13	COMPUTED	
Q_SCALE	2	1	1 m
D_LEVELTR	15	32767	NOW
M_LEVELTR	3	1	Level NTC, specified by NID_NTC X
NID_NTC	8	FINITE VALUE	valid value for NID_NTC X

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Telegram-B1: Balise-Information (L1 MA, Gradient Profile, International Speed Profile, Level Transition Order)			
VARIABLE	Length	VALUE	COMMENTS
L_ACKLEVELTR	15	200	acknowledgement area
N_ITER	5	0	No mixed level area
NID_PACKET	8	11111111b	Packet 255 – End of information

Telegram-B2: Balise-Information			
VARIABLE	Length	VALUE	COMMENTS
Q_UPDOWN	1	1	Uplink
M_VERSION	7	0100000b	ETCS system version 2.0
Q_MEDIA	1	0	Balise
N_PIG	3	1	2 <sup>nd</sup> Balise
N_TOTAL	3	1	2 Balises in group
M_DUP	2	00b	no duplicates
M_MCOUNT	8	255	identical Value for all balises of the group
NID_C	10	FINITE VALUE	ID of country / region
NID_BG	14	FINITE VALUE	ID of Balise Group
Q_LINK	1	0	<b>Unlinked</b>
NID_PACKET	8	11111111b	Packet 255 – End of information



End Conditions	Value	Comments
STM State	NP	
ETCS Mode	SN	
ETCS Level	NTC X	
Train State	Moving	
ETCS Train Data	unchanged	
Active DMI channel connection	not relevant	
Other DMI channel connections	not relevant	
TIU Connection	not relevant	
BIU Connection	not relevant	
JD Connection	not relevant	
TIU Regenerative Brake Command	not relevant	
TIU Magnetic Shoes Brake Command	not relevant	
TIU Eddy Current Brake Command for emergency brake	not relevant	
TIU Eddy Current Brake Command for service brake	not relevant	
TIU Pantograph Command	not relevant	
TIU Air Tightness Command	not relevant	
TIU Main Switch / Circuit Breaker Command	not relevant	
TIU Traction Cut Off Command	not relevant	
TIU Traction Cut Off Status	not relevant	
TIU Direction Controller Position Status	forward	
TIU Cab Status (Desk Status)	cab A active	
BIU Status	not relevant	
BIU Emergency Brake Command	not relevant	
BIU Service Brake Command	not relevant	
BIU Emergency Brake Status	not relevant	
BIU Service Brake Status	not relevant	
NTC X Isolation Status	not isolated	

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