ERTMS/ETCS
Specific Transmission Module **FFFIS**
REF : SUBSET-035 ISSUE : 3.2.0 DATE : 2015-12-16

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

1. MODIFICATION HISTORY

Issue Number Date	Section Number	Modification / Description	Author
1.0.0 14-01-99		Release version	HE
1.0.1		Updating	J. Näsström
1.0.2 21-02-00	CENELEC textual review up to chapter 7. UNISIG input for bus chapter, Application layer outlined, Level Transitions not updated.	Updated according to CENELEC review 000208-09 and UNISIG meeting 16-02-00 to 17-02-00	J. Näsström
1.1.0 24-02-00		Preliminary release for ECSAG.	J. Näsström
1.1.1 25-02-00		Editorial updates.	J. Näsström
1.1.1 20-03-00	Editorial changes. Pictures in chapter 5 updated. Normative and non-normative parts better separated.	Updated according to ECSAG review 29-02-00 and CENELEC WGA9E review 080300-090300. Removed “ERTMS” in favour of “ETCS”. Requirements reformulated into “shall”, and made more precise. Brake Interface separated from Train Interface in Bus chapter.	J. Näsström
1.1.2	Bus chapter updated with physical media. Level Transitions added, with two annexes. Added annex on diagnostic recorder.	Updated according to decisions and review comments of UNISIG STM meeting 000222-000223.	J. Näsström
2.0.0 30-03-2000	Chapter 7.5.3.4: maximum of 10 indicators. Chapter 7.5.4.3: maximum of 5 buttons.	Final Issue to ECSAG	D. Degavre
A.0.1 26-04-2002	Header and Footer	Agreed changes during WP Meeting in Charleroi	U. Dräger
A.0.3 24-05-2002	All	Online changes during the WP meeting in Paris	J-Y Riou

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A.0.4 19.06.2002	Chapter 1-10 for text, 15 only picture	Including of eliminated Pictures within chapter 15 and some of the agreed changes according to the list of comments for Subset 035 issue C.0.2. The included changes are marked within C.0.2.M. No text changes at chapter 13 and following.	U. Dräger
A.0.5 2002-07-11	All	Online changes during the WP meeting in Brussels	Peter Lührs
A.0.6 2002-07-30	All	Online changes during the WP meeting in Stuttgart	U. Dräger
A.0.7 2002-08-12	Chapter 7.5.3	Home work according to the modifications for 7.4.2	U. Dräger
A.0.8 2002-08-21	Continue of chapter 7	Online changes during the WP meeting in Brussels	U. Dräger
A.0.9 2002-10-23	Chapter 9, 12 and 13	Online changes during the WP meeting in Brussels	U. Dräger
A.0.10 2002-11-18	Chapter 4.1.1, 5.1.1.2, 5.1.2, 5.1.3, 5.2.3, 5.2.5, 5.2.6, 7, 8, 10 16,17,18, 19, 20, 21	Mainly insertion of direct access for odometer and brake, new issue of chapter 7, 8, and 10, and new chapters for data entry (16) and STM test procedure (17)	U. Dräger
A.0.11 2002-11-21	Basis for this issue was the clean draft issue of A.0.10 Chapter 4.1.1, 5.2.3, 5.2.5, 5.2.6, 8, 10	Online changes during the WP meeting in Stuttgart and the inclusion of the modifications made in the separately reviewed chapters 8 and 10	U. Dräger
A.0.12 2002-12-04		Online changes during the WP meeting in Braunschweig	P. Lührs (Siemens)
2002-12-18		Online changes during the WP meeting in Brussels	R. Ramos (Invensys)
2003-01-13		Online changes during the WP meeting in Paris	R. Ramos (Invensys)
2003-01-28		Online changes during the WP meeting in Brussels	R. Ramos (Invensys)
A.0.16 2003-02-03		Requirements of SUBSET-058 included here (agreed comments). Test Procedure updated.	P. Lührs (Siemens)
A.0.17 2003-02-11		Modified after STM review meeting in Stuttgart	R. Ramos (Invensys Rail)
A.0.18 2003-02-18	Chapter 5,2.5; chapter 14 and 15; chapter 16; chapter 17; chapter 21; chapter 22	Modified as homework according to the agreements at the STM meeting in Stuttgart	U. Dräger (Alcatel)

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A.0.19 2003-02-25		Online changes during the WP meeting in Madrid	P. Lührs (Siemens) R. Ramos (Invensys Rail)
A.0.20 2003-03-11		Online changes during the WP meeting in Brussels	P. Lührs (Siemens)
A.0.21 2003-03-26		Online changes during the WP meeting in Braunschweig	P. Lührs (Siemens)
A.0.22 2003-04-08		Online changes during the WP meeting in Stockholm	P. Lührs (Siemens)
A.0.23 2003-04-16	Chapter 12 deleted (part of Subset 058), chapter 13 Vigilance deleted; chapter 19 deleted and contend included in chapter 8; chapter 15 deleted; chapter 18 replaced by proposal “B”; Including “Level Transition Requirements” in chapter 5, 7 and 8,	Homework changes as agreed during the WP meeting in Stockholm	U. Dräger (Alcatel)
A.0.24 2003-05-06	Including “Level Transition Requirements” version 007 in chapter 5, 7 and 8, including of “Data Entry” according proposal version 1.6 in chapter 14	Homework changes as agreed during the WP meeting in Stuttgart	U. Dräger (Alcatel)
A.0.25 2003-05-09	Chapter 8.5.1.3		U. Dräger Alcatel
A.0.26 2003-05-26	Content of Odometry chapter removed, Transmission of national air gap information deleted	Version for internal WP review	U. Dräger Alcatel
A.0.27 2003-06-11	New 5.3.14 Others	Online changes during the WP meeting in Brussels: Review process for version A.0.26	U. Dräger Alcatel P. Lührs Siemens
A.0.28 2003-06-19		Homework changes as agreed during the WP meeting in Brussels (2003-06-11)	P. Lührs (Siemens)
A.0.29 2003-06-23		Online changes as agreed during the WP meeting in Stockholm	R. Ramos (Invensys Rail)
A.0.30 2003-06-26	16.2, 16.3, 16.8 (Annex B)	Figures updated as agreed during the WP meeting in Stockholm (2003-06-25)	P. Lührs (Siemens)
A.0.31 2003-07-02		Online changes as agreed during the WP meeting in Madrid	M. Deladrière (Alstom)

Issue Number Date	Section Number	Modification / Description	Author
A.0.32 2003-07-14		Preparation for the final delivery issue Chapter 10 included: Updated after pending comments from Brussels meeting. Also includes solution on the different needs for non-statistical and statistical. ETCS shall send either non-stochastical only, or both statistical and non-statistical	U. Dräger Alcatel
2.1.0 2003-07-15		Updated during the WP meeting in Brussels (2003-07-15)	P. Lührs (Siemens)
2.1.1 2003-07-24	3.1.1.9, 5.1.1.2, 5.1.2, 5.1.3, 5.2.8.2, 6.1.3, 7.3.1.4.2, 7.3.1.5.2, 7.3.1.6.4, 7.3.1.7.5, 7.4.1.1.5, 7.4.1.2.5, 7.4.1.3.5, 7.4.1.3.6, 10.3.1.12, 10.6.5.6, 10.6.5.15.4, 10.6.5.16, 12.1.2.1.1., 13.1.1.2, 15.2.1.3, 17.4.3.18, 17.4.3.19, 17.4.3.20, 17.7.2.16, 17.7.2.17, 17.7.2.18.	Updated according to the meeting between the FFFIS STM WP and the EEIG	R. Ramos (Invensys Rail)
2.2.0 2010-12-17	15.2 several 7.3.1.6.2, 7.3.1.6.3, 7.4.2.2.1, 7.4.2.2.4, 16.1, 16.2, 16.3, 16.6, 16.7	Compatibility Number changed to 3.1.Z, as the compatibility is not affected. Spelling and grammar failures corrected. WG-39: Abbreviations for STM max speed, STM system speed / distance harmonized with SUBSET-058	P. Lührs (Siemens)

Issue Number Date	Section Number	Modification / Description	Author
	15.2.1.3	Compatibility Number changed to 3.2.Z, as the compatibility is not affected.	A. Fanea (Ansaldo Signal)
	7.4.2.2.6, 7.4.2.3.4	WG-6, requirements added.	
	5.2.4.3.	WG-7, comments added.	
	7.6.2.6.	WG-8, requirement updated.	
	7.3.1.2.4, 7.4.1.2.2, 7.4.1.2.3	WG-10, requirement added.	
	7.3.1.2.9	WG-11, requirement updated.	
	7.4.2.4.1, 7.4.2.4.1.1	WG-13, requirements updated.	
	7.4.2.4.3	WG-14, requirement added.	
	7.4.1.1.12	WG-15, requirement updated.	
	5.2.11.1, 5.2.11.2, 5.2.11.3, 5.2.11.4, 13.3.1.1.1, 13.3.2.1.3	WG-16, WG-35, requirements updated.	
	10.6.3.4	WG-17, requirement updated.	
	7.4.1.2.3	WG-19, requirement updated.	
	7.4.1.1.4	WG-21, requirement updated.	
	7.4.1.2.3	WG-25, requirement updated.	
	7.4.2.2.1.1	WG-27, requirement updated.	
	7.4.2.2.1.2, 7.4.2.2.4.2	WG-30, requirement added.	
	7.4.2.3.3	WG-32, requirement added.	
	5.2.10.1	WG-37, requirement updated.	
	7.3.1.3.6.1	WG-50, note added.	
	7.4.1.1.12.1	WG-52, note added.	
	13.1.1.1.17	WG-57, requirement deleted.	
	10.7.2.5	WG-63, requirement updated.	
	7.5.1.2	WG-66, requirement updated.	
	10.5.3.5.1, 10.5.3.5.2, 10.5.3.5.2.1	WG-67, requirements added.	
	10.5.2.2.1, 10.5.2.2.2, 10.5.2.2.2.1	WG-68, requirements added.	
	7.4.1.2.2	WG-70, requirement updated.	
	8.1.1.22	WG-71, requirement added.	
	1.1.1.1.1	WG-74, WG-74bis requirement updated.	
	13.3.2.1.3.1	WG-81, requirement added.	

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	7.3.4.4 7.6.1.6 7.4.1.1.13 7.4.1.1.14, 7.4.1.1.15 13.1.1.2.1.1, 13.1.1.2.1.2 10.6.3.10, 10.6.3.11 7.4.2.2.1.3 7.5.1.3, 10.7.2.5, 10.7.3.5, 13.3, 13.3.1.1.1, 13.3.2.1.1, 13.3.2.1.1.1, 13.3.2.1.1.3, 13.3.2.1.3, 13.3.2.1.4, 13.3.2.1.5 7.4.1.2.2, 7.4.1.2.3	WG-3, Requirement updated. WG-23, Requirement added. WG-25bis, Requirement updated. Requirements added. WG-26, Notes added. WG-28, Requirements added. WG-33, Requirement added. WG-34, Requirement updated. WG-49, Requirements updated.	A. Fanea (Ansaldo Signal)

Issue Number Date	Section Number	Modification / Description	Author
		WG-29, WG-55, WG-56, WG-58	A. Fanea (Ansaldo Signal)
	Figure 19, 13.1.1.2.7	Requirements updated	
	13.1.1.2.8, 13.1.1.2.9	Requirements added	
	13.1.1.2.10, 13.1.1.2.10.1, 13.1.1.2.10.2	WG-29bis, WG-45, Requirements added	
	13.1.1.2.4	Requirement updated.	
	7.4.1.1.3, 7.4.1.1.4	WG-31bis, Requirements updated.	
	7.4.1.1.16	Requirement added.	
	7.4.2.1.1, 16.8	WG-40, Requirement updated.	
	7.4.1.2.2, 7.4.1.2.3, 7.4.1.2.4.1.1	WG-41, WG-85, Transition E4a added, transition B6 updated	
	16.4	WG-43, System diagram updated	
	16.4.1	System diagram added	
	7.4.1.2.2, 7.4.1.2.3, 13.1.2.3.1	WG-56, Transition N16 added.	
	13.1.2.7, 13.1.2.7.1	Requirement added	
	13.2.2.1.4.1	WG-59, Requirements updated.	
	1.1.1.1.1.1	WG-60, Requirement added.	
	7.6.1.4.1	WG-61, Note added.	
	7.6.1.4.3	WG-72, Requirement updated,	
	10.5.3.7, 10.5.3.8	Requirement added.	
	14.3.1.11.1	WG-73, Requirements added.	
	13.2.2.1.5	WG-77, Note added.	
	10.6.3.12, 10.6.7.4	WG-78, Requirements updated.	
	7.4.2.2.1.1, 7.4.2.2.4.1, 1.1.1.1	WG-82, Notes added.	
	7.4.1.2.4,	WG-88, Requirements added.	
	7.4.1.2.4.3	WG-92, Requirement updated	
	7.3.2.1, 7.4.1.2.2	Exception added.	
	13.1.1.2.11, 13.1.1.2.11.1	WG-93, Requirements updated.	
	5.2.3.1, 8.1.1.3	WG-96, Requirements added.	
	7.6.4.1, 7.6.4.2	WG-101, Requirements updated.	
	7.3.4.6, 7.4.1.3.7	WG-75, Requirements updated.	
		WG-91, Requirements added.	

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	15.2.1.3	Version number updated.	A. Fanea (Ansaldo Signal)
	4.1.1.1	WG-102, Requirement updated.	
	4.1.1.6	WG-103, Requirement deleted.	
	4.1.1.5.1, 4.1.1.7.1	WG-104, Requirements updated.	
	4.1.3.2	WG-106, Requirement updated.	
	4.1.4	WG-107, Chapter and subchapters deleted.	
	4.1.5.4	WG-108, Requirement updated.	
	4.2.1.3	WG-109, Requirement updated.	
	5.1.1.1	WG-110, Requirement updated.	
	5.2.3.2.1	WG-111, Requirement updated.	
	5.2.5.4	WG-113, Requirement updated.	
	5.2.5.4.1	WG-114, Note deleted.	
	5.2.5.5, 5.2.5.7	WG-116, Requirements updated.	
	5.2.6.1	WG-117, Justification deleted.	
	5.2.9.2	WG-118, Requirement updated.	
	5.2.10.1	WG-119, Table updated.	
	5.2.12.1	WG-120, Requirement updated.	
	5.2.12.2.1	WG-121, Note updated.	
	4, 5, 6, 6.1.4, 10, 16	WG-122, Chapters updated.	
	7.1.1.1	WG-123, Requirement updated.	
	7.2.1.4	WG-124, Requirement updated.	
	7.2.1.5	WG-125, Requirement updated.	
	7.3.1.1.1.1	WG-126, Requirement updated.	
	7.3.1.2.1	WG-127, Requirement updated.	
	7.3.1.2.3, 7.3.1.2.3.1	WG-128, Requirement updated, Note deleted.	
	7.3.1.3.2, 7.3.1.3.2.2, 7.3.1.3.5	WG-129, Requirements updated,	
	7.3.1.3.2.2, 7.3.1.3.5	WG-130, Requirements updated.	
	7.3.1.3.4	WG-131, Requirement updated.	
	7.3.1.6.2.1	WG-132, Requirement updated.	
	7.3.1.7.1.1, 7.3.1.7.2.1, 7.3.1.7.2.2	WG-133, Requirement and notes deleted.	
	7.3.1.7.3, 7.3.1.7.4	WG-134, Requirements deleted.	
	7.3.1.8.1.1	WG-135, Note deleted.	

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	7.3.3	WG-137, Chapter title changed.	A. Fanea (Ansaldo Signal)
	7.3.3.2.1	WG-138, Note updated, justification.	
	7.3.3.3	WG-139, Figure moved to 7.3.2.3.	
	7.3.4.5	WG-140, Requirement updated.	
	7.4.1.1.10	WG-142, Requirement updated.	
	7.3.1.2.9	WG-143, Requirement updated. 7.4.1.1.12.1 Note deleted, see WG-52.	
	7.4.1.1.13, 7.4.1.1.14, 7.4.1.1.15	WG-144, Requirements updated.	
	7.4.1.1.14, 7.4.1.1.15	WG-145, Requirements updated.	
	7.4.1.2.3	WG-148, Requirement updated.	
	7.4.1.2.3	WG-149, Requirement updated.	
	7.4.1.2.3.4	WG-150, Requirement became a note.	
	8.1.1.2	WG-153, Requirement updated.	
	7.4.1.1.7	WG-177, Requirement updated.	
	7.4.1.2.2.2	WG-178, Requirement deleted.	
	8.1.1.9	WG-154, Requirement deleted.	
	8.1.1.14	WG-155, Requirement deleted.	
	8.1.1.17, 8.1.1.17.1, 8.1.1.16.2	WG-156, Requirements deleted, justification moved to a note.	
	7.6.1.2.1	WG-181, Note deleted.	
	7.6.1.2.2	WG-182, Exception added.	
	6.1.3.3	WG-41bis, Requirement deleted.	
	8.1.1.19, 8.1.1.20, 8.1.1.21	WG-157, Requirements updated.	
	8.2.1.4	WG-158, Requirement deleted.	
	8.2.1.10, 8.2.1.11, 8.2.1.12	WG-159, Requirements deleted.	
	8.4.3	WG-160, Title updated.	
	10.2.3.6, 10.2.3.6.1	WG-161, Requirements updated.	
	10	WG-162, Chapter updated.	
	10.4.2	WG-163, Chapter deleted.	
	10.4.3.1	WG-164, Requirement deleted.	
	10.4.4.6, 10.4.4.6.1	WG-165, Requirement updated with the content of the note. Note deleted.	
	11.2.1.5	WG-169, Requirement updated.	

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	11.2.1.6	WG-170, Requirement deleted.	A. Fanea (Ansaldo Signal)
	13.1.1.1.5	WG-171, Requirement deleted.	
	16.2	WG-173, Drawing updated.	
	13.1.2.2	WG-174, Requirement updated.	
	7.6.1.7	WG-175, Requirement added.	
	4.2.1.3.2	WG-180, Exception added.	
	8	WG-179, Chapter updated.	
	5.2.13	WG-65, Chapter deleted.	
	10.6.6.1	WG-80, Requirement updated.	
	5.2.4.3	WG-112, Requirement updated.	
	5.2.4.6	WG-115, Requirement updated.	
	5.2.5.1, 5.2.10.1	WG-119bis, Requirements updated.	
	5.2.5.5.1, 5.2.5.6.1 5.2.5.8 7.3.1.8.2	WG-136, Exceptions added, Requirement updated, Requirement deleted	
	7.4.1.2.3	WG-146, Requirement updated.	
	7.4.1.2.3	WG-148, Requirement updated.	
	7.4.1.2.3	WG-149, Requirement updated.	
	13.1.1.1.10.1	WG-186, Note added.	
	7.6.2.2	WG-187, Definition updated.	
	7.4.2.2.1	WG-151, Requirement updated.	
	8.7.1.2 8.7.1.5 to 8.7.1.9.3 Figure 8	WG-185, Requirement updated, requirements deleted Figure deleted.	
	7.4.2.1.2 16.8	WG-40bis, Requirement added. Requirement updated.	
	8.1.1.6, 8.3.1.9, 8.3.3.2, 8.3.3.3, 8.3.3.4, 8.3.3.5, ch 8.4.4, 8.5.2, ch 8.5.3, ch 8.8	WG-188, Requirements deleted,	
	8.1.1.7, 8.3.1.8, 8.3.1.10, ch 8.3.3, 8.4.3, 8.5.2.1, 8.5.4.1, 8.5.4.2	Requirements updated.	
	7.4.1.2.2, 7.4.1.2.3	WG-5, WG-147bis, Requirements updated.	
	13.3.2.1.7	WG-183, Requirement added.	
	7.3.4.1.3, 7.4.1.1.7	Editorial modification.	
	10.7.3.4, 10.7.3.5	WG-193, Requirements updated.	

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	13.3.1.1.1 13.3.1.1, 13.3.1.2, 13.3.1.3, 13.3.1.4, 13.3.1.5, 13.3.1 7.4.1.3.1.1	WG-189, Requirement deleted, Requirements added. Requirement updated. WG-79 Note added	A. Fanea (Ansaldo Signal)
	10.7.2.4 10.7.2.5 7.4.1.2.2 7.4.1.1.14 7.4.2.2.2.2 4.1.1.10 16.8 5.2.10.1 7.3.1.2.8.1	WG-195 Requirement updated. WG-197 Requirement updated. WG-198 Requirement updated. WG-202: Note added WG-199: Definition added WG-200: Figure updated WG-201: Requirement updated WG-205: Note added	A. Schoevaerts (Alstom)
	7.4.1.3.6 7.4.1.2.2, 7.4.1.2.3 4.1.2, 4.1.5.6, 5.1.2, 5.2.14, 8.2.1.3, 8.2.1.3.1, 9, 10.3.1.9, 10.7.1.2 4.1.3.1, 4.1.3.2, 5.1.1.1, 5.2, 5.2.1.1, 5.2.5.3, 5.2.5.5, 7.2.1.4, 7.2.1.5, 7.3.1.2.4, 7.3.1.7.1, 7.4.1.1.2, 7.4.2.1.2, 10.7.1.3, 10.7.2.1, 10.7.3.1 5.2.10.1, 7.4.1.2.3, 10.7.2.5, 10.7.3.5, 14.5.1.9 16.1, 16.2, 16.4, 16.4.1, 16.6, 16.8 Figure 3 7.3.3, 7.3.3.1.1, 7.3.3.1.2, 7.3.3.2, 7.3.3.2.1, 7.4.1.2.3, 7.4.2.2, 7.4.2.2.7, 7.4.2.4.4, 7.4.2.5.1, 7.4.2.5.2, 7.4.2.5.3 16.4, 16.4.1, 16.6 7.4.2.4.4 13.1.1.1.24 4.2.1.3, 4.2.1.3.1	WG-215: Requirement updated. WG-217: New state transition H4a WG-226 (CR 821): Requirements deleted Requirements updated Tables updated Figures updated WG-104: Figure updated WG-43 (CR 618): Requirements updated WG-43 (CR 618): Figures updated WG-190: Requirement added WG-225: Requirement added WG-234: Requirements updated	T. Mandry (Alstom)

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	7.3.2.2	WG-235: Transition 4b updated	
	4.1.1.4, 7.4.1.1.7, 7.4.1.1.16, 14.4.1.3	WG-236: Requirements updated	
	5.2.10.2, 5.2.10.2.1, 5.2.10.3	WG-12: Requirements added	
	7.4.1.2.2, 7.4.1.2.3	WG-24: Tables updated	
		WG-42 (CR 410):	
	4.1.1.10, 7.4.1.4, 7.4.1.5, 10.5.2.2, 10.5.2.2.1, 10.5.2.2.2, 10.5.2.2.3	Requirements updated	
	6.1.4, 6.1.4.1, 6.1.4.2, 6.1.4.3	Requirments added	
	7.4.1.2.2, 7.4.1.2.3	Tables updated	
	7.4.1.6.2.2, 7.4.1.6.2.3	WG-84: Requirements added	
	7.3.1.7.1.1	WG-100: Note added	
	10.7.3.5	WG-168: Table updated	
	15.2.1.3	WG-194: Table updated	
	7.4.1.5	WG-196: Requirement updated	
	5.2.10.4, 5.2.10.4.1	WG-203: Requirement and note added	
	7.4.2.3.4	WG-206: Requirement updated	
	7.3.1.5.2, 7.3.1.6.4, 7.3.1.7.5	WG-209: Requirements updated	
	7.4.1.2.4.1.1	WG-210: Requirement updated	
	7.4.2.2.6, 7.4.2.2.7	WG-213: Requirement updated, note added	
	10.7.2.5, 10.7.2.6	WG-216: Table and requirement updated	
		WG-221:	
	5.2.11.1, 5.2.11.1.1	Requirement and note deleted	
	5.2.11.2, 5.2.11.3, 5.2.11.4	Requirements updated	
	13.3.2.1.1.2	WG-224: Requirement updated	
	7.4.1.3.8, 7.4.1.3.8.1	WG-227: Requirement and note added	
	7.3.3.1	WG-228: Requirement updated	
	7.4.2.2.2, 7.4.2.2.2.2	WG-229: Requirement and note updated	
	7.3.1.3.1, 7.3.1.3.2.2	WG-230: Requirement updated and note added	

Issue Number Date	Section Number	Modification / Description	Author
	5.2.11.3, 7.3.1.2.9, 7.4.1.1.12	WG-232: Requirements updated	
	10.7.1.3	WG-233: Requirement updated	
	7.4.1.2.3	WG-238: Transition G4a updated	
	10.5.2.9	WG-239: Requirement added	
	5.2.11.2, 5.2.11.3	WG-242: Requirements updated	
	13.1.1.2.10.1, 13.1.1.2.10.3	WG-243: Requirement updated and note added	
	5.2.11.2.2	WG-245: Footnotes added	
		WG-246:	
	3.1.1.20	Reference added	
	5.2.11.2	Requirement updated	
	5.2.11.2.2	Requirement added	
	5.2.11.4	WG-247: Requirement updated	
	5.2.13, 5.2.13.1, 5.2.13.2, 5.2.13.3	WG-248 (CR 660): Requirements added	
		WG-249 (CR 812):	
	7.4.2.2.1, 7.4.2.2.1.2, 7.4.2.2.3, 7.4.2.3.1	Requirements updated	
	7.4.2.2.1.1, 7.4.2.2.1.3, 7.4.2.3.2	Requirement deleted	
		WG-250:	
	13.1.1.1.16.1, 13.1.1.2.5.1	Requirements added	

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	5.2.8.2, 5.2.12, 5.2.12.1, 5.2.12.2, 5.2.12.3, 7.3.1.3.3, 7.3.1.3.5, 7.3.1.4.1, 7.3.1.4.1.1, 7.3.1.4.3, 7.4.1.2.3, 13.1.1.1.2, 13.1.1.1.8, 13.1.1.1.10.1, 13.1.1.1.12, 13.1.1.1.13, 13.1.1.1.14, 13.1.1.1.15, 13.1.1.1.16, 13.1.1.1.18, 13.1.1.1.19, 13.1.1.1.20, 13.1.1.1.22, Figure 19, 13.1.1.2.2, 13.1.1.2.3, 13.1.1.2.4, 13.1.1.2.5, 13.1.1.2.6, 13.1.1.2.7, 13.1.1.2.8, 13.1.1.2.9, 13.1.1.2.10, 13.1.1.2.10.1, 13.1.1.2.10.2, 13.1.2.1, 13.1.2.2, 13.1.2.3, 13.1.2.3.1, 13.1.2.4, 13.1.2.5, 13.1.2.6, 13.1.2.7, 13.2.3.1.3, 13.2.3.1.4.3, 13.2.3.1.5	Wording corrected	
		WG-251:	
	7.3.3.1, 7.3.3.1.1, 7.3.3.2, 7.3.3.2.1, 7.4.2.5.1, 7.4.2.5.2, 7.4.2.5.3	Requirements updated	
	7.4.1.2.3	Table updated	
	16.4, 16.4.1, 16.6	Figures updated	
		WG-253:	
	5.2.12.5, 5.2.12.6, 5.2.12.7, 7.3.1.5.1.1, 7.3.1.6.5, 7.3.1.7.6	Requirements added	
	5.2.12.7.1, 7.3.1.4.3.1, 7.3.1.6.5.1, 7.3.1.6.5.2, 7.3.1.7.6.1, 7.3.1.7.6.2	Notes added	
	7.3.1.3.3, 7.3.1.3.5, 7.3.1.4.3, 13.1.1.2.7	Requirements updated	
	5.2.8.4, 13.3, 13.3.1.1, 13.3.1.2, 13.3.1.3, 13.3.1.4, 13.3.1.5, 13.3.2.1.1, 13.3.2.1.1.1, 13.3.2.1.1.3, 13.3.2.1.3, 13.3.2.1.4, 13.3.2.1.5	WG-254: Requirements updated	

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		WG-255:	
	5.2.12.3, 7.4.1.1.13, 13.1.1.1.8, 13.1.1.2.4, 13.1.1.2.11.1	Requirements updated	
	5.2.12.4	Requirement added	
	7.4.1.1.13.1	Note added	
		WG-260:	
	7.4.1.2.3	Transition G4a updated	
	7.5.1.3, 13.3.2.1.1, 13.3.2.1.1.1, 13.3.2.1.1.2, 13.3.2.1.1.3, 13.3.2.1.1.3.1, 13.3.2.1.3, 13.3.2.1.3.1, 13.3.2.1.4, 13.3.2.1.5, 13.3.2.1.6 ,13.3.2.1.7	Requirements updated	
	5.2.4.3	WG-261: Table updated	
	7.4.1.2.4.3, 7.4.1.2.4.1.1	WG-265: Requirement moved	
	Figure 4	WG-267: Figure deleted	
	10.3.1.10	WG-268: Requirement updated	
	10.5.3.7, 10.5.3.8	WG-269: Requirements updated	
	5.2.5.5, 5.2.5.5.1, 5.2.5.6, 5.2.5.6.1, 7.3.3.2, 13.3.2.1.1.3.1, 13.3.2.1.5	WG-270: Requirements updated	
	5.2.9.2	WG-271: Requirement updated	
	7.4.1.1.3, 7.4.1.1.16	WG-272: Requirements deleted	
	7.4.1.2.3	WG-273: Transitions B9 and C9 updated	
	3.1	Update of the SRS version	
	17	Addition of a footnote about the status of this part	
	7.4.1.2.3	WG-275: changed wording of “type” in J16/k16 to “NID_STMTYPE”.	Frank Simon (SIEMENS) 27. May 2010
	8.1.1.7	WG-275 Deleted	
	10.5.2.2	WG-275 Added link to 4.1.1.10 (Definition of active STM)	
	General	WG-275 Replace all references /1/ with a new ref	

Issue Number Date	Section Number	Modification / Description	Author
	4.1.3.1	WG-275	
		Change ~~technical~~ mode	
	5.1.1.2	WG-275	
		Changed “if required due to performance reasons” to “optional”	
	7.4.2.2.6	WG-275	
	7.4.2.2.7	Modified wording	
	7.4.2.3.4		
	7.4.1.1.10	WG-275	
		Deleted the “comma”	
	7.4.1.2.3.3	WG-275	
		Corrected first bullet: is → if	
	13.2.2.1.3	WG-275	
	13.2.2.1.4.1	Deleted the comma after “RV”	
	7.4.1.2.4.1.1	WG-276	
		Exception 2: … need not send …	
	7.4.1.3.7	WG-277	
		Added a new note as clarification	
	7.4.1.6.2.2	WG-279	
	7.4.1.6.2.3	clarified JRU as recording device and added NID_STM as information	
	7.4.1.3.5		
	10.6.3.10	WG-280	
	10.6.3.11	Allow more then 10 text messages	
	5.2.12.6	WG-283	
		Added skip condition to invalidate STM data	
	13.1.1.2.11.1	WG-286	
		Deleted unnecessay part	
	7.3.1.6.5.2	WG-253	
		Replace “null” be “0”	
	5.2.8.5	WG-275	
	5.2.8.6	Added responsibilities of CONTROL	
	5.2.8.7		
	7.4.1.2.3	WG-274	
		Modified I16	
	5.2.11.2.2	WG-246	
		Modified bullet “Brake Position”	
	7.4.1.2.3	WG-264	
		Consistent usage of STM X and STM Y	

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	5.2.10.1 7.3.2.3 1 5.2.8 7.4.1.3.7.1 7.4.1.2.3 7.3.4.2 16	WG-262 Added PS (= SH) and LS (=OS) WG-263 Consistency with SUBSET-058 WG-287 Modified reference of WG-275 Template updated Added a “The STM Control Function shall…” Corrected: “Note:” Corrected I16: “(“ Added B6: “STM X” A16: modified wording “state transition table” to “state order transition table” Added reference to 7.3.2.2 SRS version deleted in figures	Frank Simon (SIEMENS) 2010-06-29

Issue Number Date	Section Number	Modification / Description	Author
		WG-288 Editorial changes	
	8.3.1.8	8.3.1.8 useless “bullet”: deleted	
	10.6.7.2	10.6.7.2 deleted the "Refer to “warning limit” within /4/ SRS…" and "Refer to “indication limit” within /4/ SRS…"	
	10.7.2.1	10.7.2.1 modified "The following table gives all the driver inputs available **in SN mode**."	
	10.7.3.1	10.7.3.1 modified "The following table gives all the On-board outputs to the Driver available **in SN mode**."	
	10.7.2.5	10.7.2.5 Modified "**Actions on** STM buttons"	
	8.8	Added three figure-markers for correct numbering of figures	
	5.1.1.2	Wording: separate odometer	
	5.2.4.6	Added reference to 14.5.1.9	
	5.2.5.6.1	Added sentence “.. while not in DA state”	
	5.2.9.1.3	References to 10.7.2 and 10.7.3 instead of 10.7.2.5 and 10.7.3.5,	
	5.2.10.1	Reference to 4.1.1.10 added	
	5.2.11.2	Reference to 5.2.11.2.2 added	
	7.3.1.3.1	Wording “… wait that …” → “wait until”	
	7.3.1.3.2.1	Deleted link 5.2.10.2	
	7.3.4.1	Replaced “..and …” with “… or …”	
	7.4.1.5	Added the “x” to “STMx state is DA”	
	7.6.2.2	Added “-“ in “SUBSET-0XX”	
	11, 12	Modified chapter names (JRU and DRU)	
	10.2.2.1 10.2.2.2 10.2.2.3 10.2.3.1	Modified “hardware DMI” → “DMI hardware”	
	10.5.1.1	Deleted reference 4.1	
	13.1.2.3.1	Added reference 7.4.1.2.3, N16	
	8.3.3.5	WG-289 Delete paragraph	
	17	WG-69 Deleted	
	7.3.1.8.4	WG-293 Deleted “any national recorder”	

Issue Number Date	Section Number	Modification / Description	Author
	7.4.1.1.15	WG-294 Added “Default” to 7.4.1.1.15 Added note	
	16	WG-291 Modified the figures of chapter 16 16.1/2/4: add LS to “Mode of the EVC” 16.1/2 : delete the “supervision data” 16.2: delete the yellow boxes Add UN to “Mode of the EVC” Add “0” to “Level of the EVC” 16.4.1 Add “UN” to “mode of the EVC” in ETCS Supervision.	
	10.5.3.1 10.6.4.6 10.6.5.8 10.6.6.1 7.6.1.2 7.6.1.2.1 7.6.1.2.2 7.6.1.3 7.6.1.4.1 7.6.1.4.3 13.1.1.1.7 13.2.3.1.2 5.2.10.5 7.4.1.7 13.1.1.2.8.1 13.1.1.2.8.2 13.1.1.2.11.1	WG-223 Deleted Added “optional” Ditto Ditto WG-266 Added requirements to allow reconnection every 10 seconds. WG-284 New requirements for 13.1.1.1.7 WG-285 Intentionally deleted WG-220 New Chapters added WG-295 New requirements added Added e.g.	Frank Simon (SIEMENS) 2010-07-01
	General	Minor formatting corrections	T. Mandry (Alstom) 2010-07-06
	General	WG 296: rename all variances of ERTMS/ETCS on-board	F. Simon 2010-10-05

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	7.4.2.4.2 7.3.1.3.2.1 5.2.4.4.1 5.2.5.9 5.2.5.9.1	WG-292	F.Simon 2010-11-16
	18	WG-298	
	13.3.2.1.1.3 13.3.2.1.1.3.1	WG-299	
	Header	WG-300	
	7.4.2.4.1.1	WG-240	G.Pagliarulo (Mermec) 2010-11-23
	General	WG-302: rename “Level STM” to “Level NTC”, “NID_STM” to “NID_NTC” and “STM National” mode to “National System” mode according to CR802	G.Pagliarulo (Mermec) & Thomas Mandry (Alstom) 2010-12-17
	4.1.1.9, 4.2.1.2, 7.4.1.3.8, 7.4.1.3.8.1, 16.1, 16.2, 16.6, 16.8	WG-302: Replaced “Take Safe action” with “Apply Brake” (CR802)	
	4.2.1.1.1, 7.3.1.3.3, 7.4.1.1.13, 7.4.1.1.13.1, 13.1.1.2.10.3	WG-301: Requirements and notes updated	
	18	WG-301: Figure updated	
	5.2.11.2	WG-303: part d) updated according to CR953	
	15.2.1.3	Document version changed	
2.9.1 2012-01-21	New Structure of document. Modified all sections	CR 1071	F. Simon (Siemens) & Thomas Mandry (Alstom)
	10.3.3.5, 10.3.3.6	CR 908	
	10.11.1.2	CR 904	
	10.7	CR 1074 → NTC Data Entry	
	10.8	CR 1074 → NTC Data View	
	15.2	LIMITATIONS	
	3	CR 1042 → Scope	
	7.1.2	CR 1043 → version check	
	7.2	CR 1043 → multicast	
	16	CR 1043 → version management	
	4.1.1.1, 10.1.1.3, 10.2, 10.3.2, 10.3.3.6, 10.11.1.1	CR 1044	
	10.9	CR 1045 → STM Test Procedure	

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	8.3.1.2, 8.3.1.2.2, 10.3.2, 10.7.4.9, 10.8.1.5, 12.4.1.1.1	CR 1046	
	(7.5)	CR 1047 → deleted complete section engineering rules	
	10.13	CR 1053	
	5.2.8, 13, 10.10	CR 1067 → included in chapter DMI Deletion of inhibition	
	13.2.1.5, 13.2.1.5.1, 13.2.1.6	CR 1069 → included in chapter DMI	
	10.1.1.1, 10.14	CR 1070 → Added configuration list	
	12	CR 1071 → new odometry chapter	
	10.7.3.8	CR 1072 → Specific NTC Data Entry layout configuration	
	5, 6.4, 6.5, 10.1.1.5, 11, 13.3	CR 1073	
	10.3.2	CR 1068 → new Transition to DA → CS in case of ETCS mode TRIP	
	17	CR 809 (balise arrows)	
	13	CR 1066	
	All	Shorten reference to ref_nr (do not show the CENELEC version) Use of **C**apital **L**etters unified	
2.9.2 2012-02-20	3.1	Deleted references to Subset-054 & Subset-059, corrected title of Subset-058	Thomas Mandry (Alstom) & F. Simon (Siemens)
	First page	ERA review comment #1: Use “ERTMS/ETCS” instead of “ERTMS/ETCS – Baseline 3”	
	All	**C**apital **L**etters, no document names in references, correct usage of “ERTMS/ETCS on-board”, grammar corrections	

Issue Number Date	Section Number	Modification / Description	Author
	6.2.1.1 8.3.1.1 8.3.1.5 8.4.1.3 8.4.1.4 8.5.1.1 8.6.1.1.1 8.6.1.2 8.6.1.3.1 9.2.1.2.1 10.3.3.2 10.7.3.3 10.8.1.3 10.12.2.1 10.12.2.2 10.14.1.2 12 12.1.1.7 13 13.2.1.3 13.2.1.4 13.2.1.5.1 14 14.1.1.3.1 16.3.1.2 18	STMWG & SG review comment: Formal changes, editorial changes	
	5.2.4.4 10.3.2.4 H4a, B6 10.7.4.3.1	Acceleration meeting 2012-02-14: Consistency to SUBSET-034: • Changed “traction cut off” to “traction status” • Changed wording of direction controller • Changed wording of active cab (from “desk open/closed” to “active cab”)	
	5.2.7.7 10.2.1.2 10.11.1.1 10.11.1.2	STM WG Review comment: Changed wording of “air gap” to “airgap” to be consistent within STM Subsets	
	5.2.7.11 10.15	CR1049: New requirements about interface 'K' Antenna/BTM ID	

Issue Number Date	Section Number	Modification / Description	Author
	5.2.7.12 10.16	CR1126: New requirements about BTM alarm	
	5.2.8.1	STMWG review comment: Added reference to definition of “default window”	
	6.3.1.4	ERA review comment #2: Changed address relation from NID_NTC to NID_STM	
	7.2.1.1	STMWG review comment: Added reference to “legal backward…”	
	10.3.2.2	STMWG review comment: Deleted transition C6	
	10.3.3.6	STMWG review comment: Clarified that the brake application is the “emergency brake application”	
	10.4.1.4	ERA/SG comment: The Brake position is always applicable for the train.	
	10.10.1.2	STMWG review comment: The Override activation (by ETCS or STM) is reported to the STMs.	
	10.11.1.1.1	SG review comment: Added note, that airgap from infill is not transmitted to STMs	
	10.11.1.3 12.3.1.8	ERA review comment #3 / #5: “Estimated” instead of “nominal” odometer values.	
	10.12.1.6.2	STMWG review comment: Added note for STM Max Speed and STM System Speed/Distance in case of level announcement.	
	11.1.1.2	STMWG review comment: Added requirement for transmission of brake performance parameters.	

Issue Number Date	Section Number	Modification / Description	Author
	11.1.1.3 13.2.1.3 13.2.1.6 13.1.1.1 13.4.3.1 13.4.4.1 13.5.1.1.7 13.5.1.1.8 13.5.1.1.10 13.5.1.2 First page	ERA review comment #4: Modified brake ~~command~~ status **/ availablility** STMWG review comment: Clarification, that the preliminary requests are included in deletion ERA review comment #6 (updated CR1066 solution): Editorial corrections Deletion of clarifiaction about yellow frame and “whole area”. Changed ‘ANSALDO SIGNAL’ to ‘ANSALDO STS’	
3.0.0 2012-02-29	No change	Baseline 3 release version	Thomas Mandry (Alstom)
3.0.1 2013-10-31	CR 1173 - #1:10.3.2.2: CR 1173 - #2: 7.1.2.1, 7.1.2.3, 9.3.1.3, 9.3.1.4, 13.3.1.2 CR 1173 - #3: 10.3.2.2, 10.3.2.4, 10.3.2.7 CR 1173 - #7: 10.3.3.4, 10.3.3.8, 10.3.3.8.1 CR 1148 : 10.7.4.6	Update according to CR 1173 and CR 1148	Frank Simon (Siemens)
3.0.2 2014-04-24	Front page	Baseline 3 1st Maintenance pre-release version	Thomas Mandry (Alstom)
3.1.0 2014-05-09	-	Baseline 3 1st Maintenance release version	Philippe Prieels

Issue Number Date	Section Number	Modification / Description	Author
3.1.1 2015-11-12	9.2.1.3, 10.2.1.2c, 10.3.2.2, 10.3.2.3, 10.3.2.4, 10.3.2.7, 10.3.2.8 (new) 11.1.1.1, 11.1.1.1.1 (new) 13.3.1.3, 13.3.1.3.1 (new), 13.4.6.4, 13.5.1.1.3, 13.5.1.2 10.7.3.5 10.7.4.3, 10.7.4.5	CR1242 CR1094 CR1265	Frank Simon (Siemens)
3.1.2 2015-12-11	10.3.2.7, 10.3.2.8, 11.1.1.1b, 11.1.1.1.1, 13.3.1.3, 13.3.1.3.1	Update as per review comments agreed in EECT meeting 16 (08/12/2015)	Thomas Mandry (Alstom)
3.2.0 2015-12-16	-	Baseline 3 2nd release version	Thomas Mandry (Alstom)

2. TABLE OF CONTENTS

3. GENERAL

3.1 References

Ref. N°	Document Reference	Title
[1]	SUBSET-026	System Requirements Specification
[2]	SUBSET-056	STM FFFIS Safe Time Layer
[3]	SUBSET-057	STM FFFIS Safe Link Layer
[4]	SUBSET-058	FFFIS STM Application Layer
[5]	CENELEC 50170-2 (1996)	PROFIBUS
[6]	SUBSET-034	FIS for the Train Interface
[7]	SUBSET-041	Performance Requirements for Interoperability
[8]	CENELEC EN 50159 (2010)	Safety related communication in transmission systems
[9]	ERA_ERTMS_015560	ETCS Driver Machine Interface
[10]	SUBSET-101	Interface “K” specification
[11]	ERA_ERTMS_040001	Assignment Of Values To ETCS Variables

3.2 Scope and purpose

3.2.1.1 The acronym FFFIS stands for “Form Fit Functional Interface Specification”. This means an interface specification covering all protocol levels of communication, and including connector and physical level.

3.2.1.2 The lowest level boundary of this specification is the “Field Data Link” layer of the PROFIBUS. The term “bus” used afterwards in the document corresponds to this FDL layer. The referenced PROFIBUS standards cover the lowest communication layers, physical layer including connector, see [5].

3.2.1.3 The upper boundary of the specification describes the functions linked to the interface between an ERTMS/ETCS on-board equipment and an STM.

3.2.1.4 The FFFIS STM specifies the set of requirements enabling the ERTMS/ETCS on-board equipment to be connected to any STM (i.e. the ERTMS/ETCS on-board and the STMs are interchangeable), so that:

a) The functionality of the assembly ERTMS/ETCS on-board equipment / STM operating in level NTC / mode SN is equivalent to the one of the legacy National Train Control system,

b) The transitions between ERTMS/ETCS and a National System and the transitions between National Systems are seamlessly performed, with no additional constraint exported on the trackside other than the installation of Eurobalises for the level transitions.

3.2.1.5 Within the set of requirements allocated to the ERTMS/ETCS on-board in this FFFIS STM, the access to some of the ERTMS/ETCS on-board standardised interfaces (DMI, Train Interface, Juridical Recording interface) or functions (e.g. odometer) allows minimising the number of interfaces/components needed for the installation of several National Systems on-board.

3.2.1.6 However, the use of specific interfaces or functions by National Systems, instead of these ERTMS/ETCS on-board interfaces/functions offered through this FFFIS STM, is permitted as long as it does not export any requirement on the ERTMS/ETCS on-board in addition to the ones specified in this FFFIS STM. Their choice and their definition are outside the scope of this specification.

3.2.1.7 Any implementation that does not comply with the clause 3.2.1.6 is considered as not compliant with the FFFIS STM and is outside the scope of this specification.

3.2.1.8 The use of the Interface “K” (see document ref [10]), which offers access to the KER balise interface, also allows minimising the number of antennas installed on-board, but is not considered as part of this FFFIS STM as the data is not transmitted over the PROFIBUS.

4. INTRODUCTION

4.1 General requirements

4.1.1.1 The STM shall be identified by a unique number NID_STM. The NID_STM value used by the STM shall be equal to one of the NID_NTC values as specified in the list referenced in document [11].

4.1.1.2 STM shall use the common Time information from ERTMS/ETCS on-board distributed through the STM interface.

4.1.1.3 Only one STM shall be active (supervising) at a time (see chapter 10.3.3.2 for definition of active STM).

4.1.1.4 The ERTMS/ETCS on-board shall be responsible for monitoring the STM interface safety integrity of connected STMs and for applying the emergency brake in case of failure of the active STM.

4.1.1.4.1 Justification: The failure of a non active STM is not critical to train safety.

4.2 STM Isolation

4.2.1.1 It shall be possible to isolate an STM from its interface to the ERTMS/ETCS on-board equipment. The isolation shall ensure that the function of the bus is not disturbed by the isolated STM.

5. ERTMS/ETCS ON-BOARD FUNCTIONS

5.1 Functional architecture

5.1.1.1 The ERTMS/ETCS on-board equipment shall allow the STM to communicate with the following functions:

a) DMI

b) STM Control

c) Reference Time

d) BIU

e) TIU

f) Juridical Data

g) Odometer

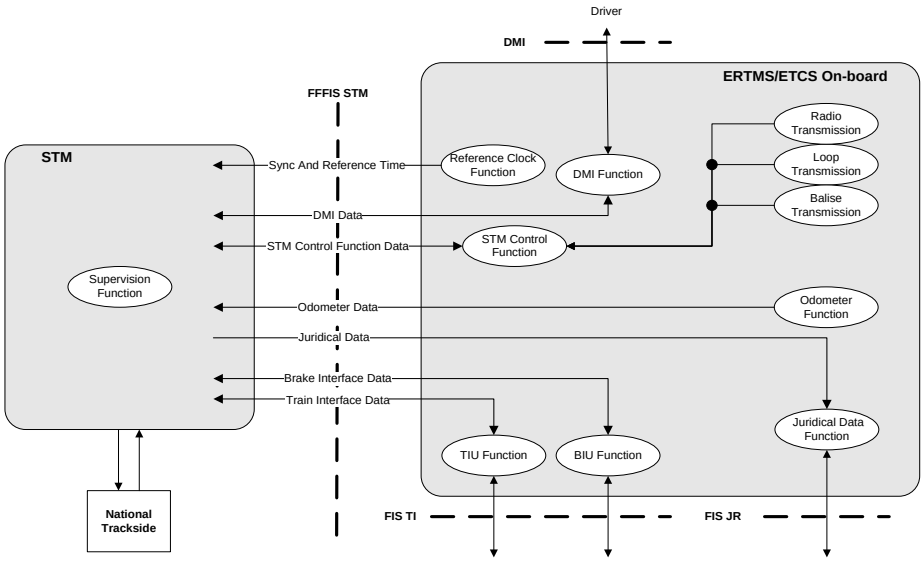


Figure 1 – General configuration of STM and ERTMS/ETCS on-board

5.2 Data and ERTMS/ETCS on-board functions

5.2.1.1 The following paragraphs describe the ERTMS/ETCS on-board functions that are available for STM and the data that shall be transmitted over the interface.

5.2.1.2 The data is transmitted over the STM bus using Multicast or Point-to-Point Connections, see chapter 6.5.

5.2.2 Reference time

5.2.2.1 ERTMS/ETCS on-board is responsible for providing common reference time to all connected STMs. This is defined in [2].

5.2.3 Odometer

5.2.3.1 Odometry data & parameters shall be sent by the ERTMS/ETCS on-board to all STMs using multicast messages.

5.2.4 Train Interface (TIU)

5.2.4.1 A subset of the train interface signals specified in [6], command and status / availability are transmitted via the FFFIS STM. These train interface signals transmitted via the FFFIS STM are called Train Interface FFFIS STM signals.

5.2.4.2 The TIU Function is described as the exchange of information between the train interface and the STM, in this case:

a) Status: is functional information coming from the train interface to the STM,

b) Command: is functional information coming from the STM to the train interface.

5.2.4.3 Train Interface FFFIS STM command signals shall be:

Command signal	Description
Regenerative Brake	To allow or to suppress the use of the Regenerative Brake.
Magnetic Shoe Brake	To allow or to suppress the use of the Magnetic Shoes Brake.
Eddy Current Brake for Service Brake	To allow or to suppress the use of the Eddy Current Brake for Service Brake.
Eddy Current Brake for Emergency Brake	To allow or to suppress the use of the Eddy Current Brake for Emergency Brake.
Pantograph	Lower or raise the Pantograph
Air Tightness	Open or close air flaps
Main Switch / Circuit Breaker	Open or close the Main Switch / Circuit Breaker. This is considered as only one command.
Traction Cut Off	Cut off or not the traction

5.2.4.3.1 Note: Service and Emergency Brake commands are handled in the BIU interface see chapter 5.2.5.

5.2.4.4 Train Interface FFFIS STM status signals shall be:

Status signal	Description
Traction status	Specifies the status of the traction power
Direction Controller information	Specifies the position of the direction controller
Cab Status	Specifies the active cab

5.2.4.4.1 Note: Service and Emergency Brake status are handled in the BIU interface see chapter 5.2.5.

5.2.5 Brake Interface (BIU)

5.2.5.1 The Brake Interface via ETCS is formally a part of the Train Interface. It shall include the brake interface parameters, command and status / availability of the Emergency Brake access and the Service Brake access.

5.2.5.2 Note: The BIU Function is separated from the TIU Function to allow physical separation and different safety and performance levels between brake commands/status and other commands/status on the Train Interface.

5.2.5.3 The brake status gives the availability of the brake command.

5.2.6 Juridical data

5.2.6.1 The FFFIS STM shall offer the possibility to the STM to transmit the national juridical data to be forwarded (together with the ETCS data) to the On-Board Recording Device.

5.2.7 STM Control Function

5.2.7.1 The STM Control Function shall control the STM state and the compatibility of the ERTMS/ETCS on-board and STM versions.

5.2.7.2 The STM Control Function shall handle the transmission of the ETCS data for STM and of the Specific NTC Data Entry/Data View for STM.

5.2.7.3 The STM Control Function shall handle the transmission of the ETCS status data for STM.

5.2.7.4 The STM Control Function shall handle the transmission of the language used to display information to the driver.

5.2.7.5 The STM Control Function shall handle the test procedure for STMs.

5.2.7.6 The STM Control Function shall handle the Override procedure for STMs.

5.2.7.7 The STM Control Function shall handle the airgap data to be transmitted to an NTC.

5.2.7.8 The STM Control Function shall handle STM max speed and STM system speed/distance.

5.2.7.9 The STM Control Function shall handle the transmission of the bus address, safety level and availability of the ERTMS/ETCS on-board functions.

5.2.7.10 The STM Control Function shall handle the display of STM failure status.

5.2.7.11 The STM Control Function shall handle the transmission of the active Interface 'K' Antenna/BTM.

5.2.7.12 The STM control function shall handle the transmission of the BTM alarm data.

5.2.8 DMI

5.2.8.1 The DMI Function shall allow an active STM to dialogue with the driver for what regards its default window (see [9] chapter 9). This includes:

a) Management of buttons,

b) Management of indicators,

c) Management of sounds,

d) Management of text messages,

e) Management of supervision information

5.3 ERTMS/ETCS on-board functions and resources available for STMs

5.3.1.1 The ERTMS/ETCS on-board shall allow the STM to access its functions and resources according to the following table:

a) x = access is allowed in all Levels

b) (x) = access is allowed in all Levels if possible

c) s = access is only allowed for an active STM (see chapter 4.1.1.3)

d) h = access is allowed for an STM in HS for preliminary request for DMI objects (see 13.2.1.5)

ERTMS/ETCS ON-BOARD functions and resources available for STMs	**NP**	**SB**	**PS**	**SH**	**FS**	**LS**	**SR**	**OS**	**SL**	**NL**	**UN**	**TR**	**PT**	**SF**	**IS**	**SN**	**RV**
STM Control Function		x	x	x	x	x	x	x	x	x	x	x	x			x	x
Reference Time		x	x	x	x	x	x	x	x	x	x	x	x			x	x
DMI Function		h			h	h	h	h		s, h	h	h	h			s, h	
Juridical Data		x	x	x	x	x	x	x	x	x	x	x	x	(x)		x	x
Odometer Function		x	x	x	x	x	x	x	x	x	x	x	x			x	x
TIU command (Train Interface FFFIS STM signals)									s	s						s	
TIU status (Train Interface FFFIS STM signals)		x	x	x	x	x	x	x	x	x	x	x	x			x	x
BIU command																s	
BIU status		x	x	x	x	x	x	x	x	x	x	x	x			x	x

5.3.1.2 When an ERTMS/ETCS on-board function fails, it shall isolate itself from the bus and shall try to close the connection with the STM.

6. BUS

6.1 The PROFIBUS

6.1.1.1 The bus used for the interface between STM and ERTMS/ETCS on-board functions shall be the PROFIBUS, defined by [5].

6.1.1.2 The PROFIBUS protocol is used up to the FDL layer.

6.1.1.2.1 Note: The use of the FDL layer is specified in [3], chapter 4.

6.1.1.3 The bus configuration parameters for the PROFIBUS shall be:

a) Baud Rate: 1500 Kbps

b) Minimum Station Delay of Responders (min TSDR): 11 tBit

c) Maximum Station Delay of Responders (max TSDR): 150 tBit

d) Slot Time (TSL): 300 tBit

e) Quiet Time (TQUI): 0 tBit

f) Setup Time (TSET): 1 tBit

g) Time Target Rotation (TTR): 30000 tBit (20 ms)

h) GAP Actualisation Factor (G): 10

i) Highest Station Address (HSA): 126

j) Max Retry Limit (max_retry_limit): 1

6.1.1.3.1 Note: This allows for a maximum permissible line length (PROFIBUS length) of 200 m per segment and a maximum number of 32 stations when using cable type A. In case a greater length or more stations are required, repeaters can be used without changing the configuration.

6.1.1.3.2 Note: PROFIBUS may also be used for other communications than the one between STM and ERTMS/ETCS on-board specified in this FFFIS STM.

6.1.2 Physical connection

6.1.2.1 The default physical medium shall be RS-485 twisted pair shielded copper cable.

6.1.2.2 The default connectors of the different equipments (ERTMS/ETCS on-board functions and STMs) shall be 9-pin female D-SUB and cabling according to PROFIBUS specifications.

6.1.3 Bus redundancy and retransmission

6.1.3.1 Retransmission is specified in [3]

6.1.3.2 Regarding bus redundancy, the STM and ERTMS/ETCS on-board shall have at least one bus interface each, and may have two interfaces.

6.1.3.3 In case STM and ERTMS/ETCS on-board do not have the same number of buses, only one bus shall be connected.

6.1.3.4 The dual bus configuration shall be managed by the “Redundancy Supervisor” see Ref.: [3].

6.2 Safety

6.2.1.1 To allow communication between different equipment with different Safety Integrity Levels (SIL), the FFFIS STM shall provide communication with three levels of safety protocol (SL):

a) Safety Level 4 (SL 4)

b) Safety Level 2 (SL 2)

c) Safety Level 0 (SL 0)

6.2.1.1.1 Justification: According to the requirements for Safety-related communication in transmission systems (see [8]), an equipment with no or a low Safety Integrity Level shall not masquerade as an equipment with a higher Safety Integrity Level. This requirement shall be fulfilled by using the defined Safety Levels.

6.2.1.1.2 Note: The three levels of safety are specified in [3] and [2].

6.2.1.2 No equipment shall implement any Safety Level corresponding to a higher Safety Integrity Level (SIL).

6.2.1.3 ERTMS/ETCS on-board functions shall implement all the safety protocols up to the Safety Level (SL) corresponding to the SIL of the function.

6.3 On-board Architecture

6.3.1.1 Each STM shall only have one physical bus address (Station/Node address) towards the ERTMS/ETCS on-board.

6.3.1.2 The ERTMS/ETCS on-board may use one or several physical bus addresses depending on its architecture.

6.3.1.3 An STM shall be able to handle one different physical address for each ERTMS/ETCS on-board function.

6.3.1.4 In case several STMs share the same physical address, each of them shall establish its own connection at Application Layer using different NID_STMs.

6.4 Physical Addressing (Station/Nodes addresses)

6.4.1.1 The physical addresses shall be allocated according to the following table.

Physical Address	Device
2	STM Control Function
0, 1, 2, 3 . . 19	Other ERTMS/ETCS on-board functions
20 . . 49	Unused by FFFIS STM
50 . . 69	STM configurable addresses range
70 . . 126	STMs (NID_NTC+70)
127	Reserved for Broadcast and Multicast

6.4.1.2 By default the Physical address of an STM shall be the NID_NTC value + 70.

6.4.1.3 STM configurable addresses range shall be used for STMs for which the sum of NID_STM value +70 goes out of the Profibus physical address range

6.4.1.4 In case several STMs share the same physical address, the address value shall be the one of any of the supported STMs or a configurable physical address.

6.4.1.5 When a physical address in the STM configurable addresses range is to be used, it shall be possible to configure the value of this physical address in order to solve any potential address conflicts.

6.5 Function Addressing

6.5.1.1 The FFFIS STM requires communication with different functions of the ERTMS/ETCS on-board as e. g. Odometer, DMI and Juridical Data.

6.5.1.2 The FFFIS STM shall use Service Access Points (SAPs) to support communication between STMs and the different ERTMS/ETCS on-board functions.

6.5.1.3 All ERTMS/ETCS on-board functions shall have a defined fixed SAP.

6.5.1.3.1 Note: The SAP is fixed regardless of the chosen physical address.

6.5.1.4 For transmitting data between ERTMS/ETCS on-board and the STMs, the local (Source) Service Access Point (SSAP) and partner (Destination) Service Access Point (DSAP) shall have the same value.

6.5.1.5 The SAP number shall be defined according to the following table:

Logical connections	SAP# (binary)	# of SAP	Comment
DMI channel 3	000000	1	Point-to-point
DMI channel 4	000001	1	Point-to-point
Juridical Data	000010	1	Point-to-point
Reserved for FFFIS STM	000011	1	Not used (reserved for backward compatibility).
DMI channel 1	000100	1	Point-to-point
DMI channel 2	000101	1	Point-to-point
Reserved for FFFIS STM	000110	1	Not used (reserved for backward compatibility).
Reserved for FFFIS STM	000111	1	Reserved for future extension of the specification
Unused by FFFIS STM	001XXX	8	To be defined by on-board implementers

Logical connections	SAP# (binary)	# of SAP	Comment
Unused by FFFIS STM	01XXXX	16	To be defined by on-board implementers
Reference Time	100000	1	Multicast
STM Control	100001	1	Point-to-point
Reserved for FFFIS STM	100010	1	Not used (reserved for backward compatibility).
Reserved for FFFIS STM	100011	1	Not used (reserved for backward compatibility).
Reserved for FFFIS STM	100100	1	Not used (reserved for backward compatibility).
Train Interface	100101	1	Point-to-point
Brake Interface	100110	1	Point-to-point
Odometer	100111	1	Multicast for FFFIS STM version number X=4
Unused by FFFIS STM	101XXX	8	Defined by each implementer.
Reserved for FFFIS STM	11XXXX Except 111111 reserved for broadcast	15	Reserved for future extension of the specification
Broadcast	111111	1	Reserved due to PROFIBUS specification

6.5.1.6 There shall be only one source (one station/node address) which shall transmit messages using the SAP reserved for the Reference Clock Function.

6.5.1.7 There shall be only one source (one station/node address) which shall transmit messages using the SAP reserved for the Odometer Function.

6.6 Protocol Layers

6.6.1.1 The protocol layers are Application Layer (see [4]), Safe Time Layer (see [2]), Safe Link Layer (see [3]) and PROFIBUS FDL layer (see [5]).

6.6.1.2 The Safe Time Layer and Safe Link Layer together shall be considered as the Safety Layers.

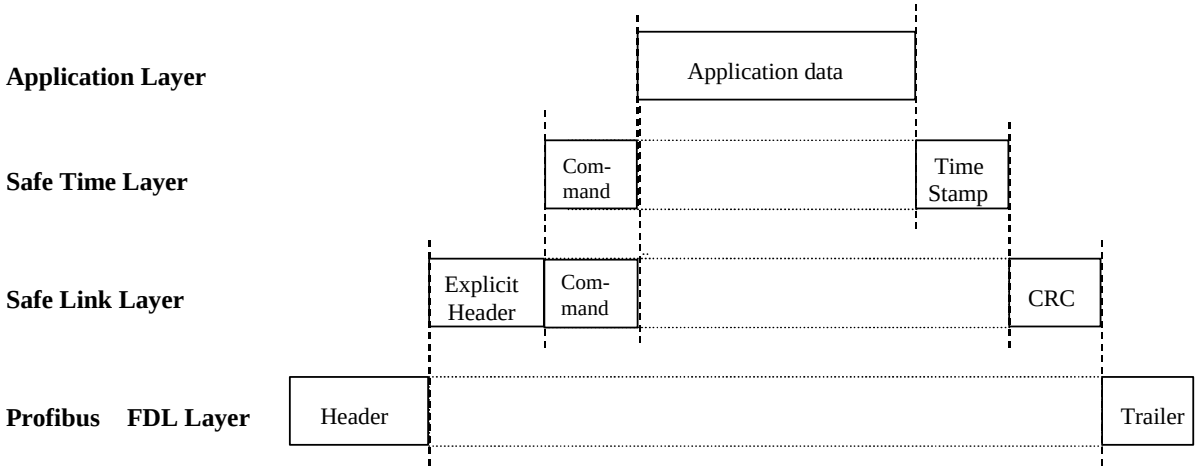


Figure 2 - Application Data encapsulation by the layers in PROFIBUS telegram

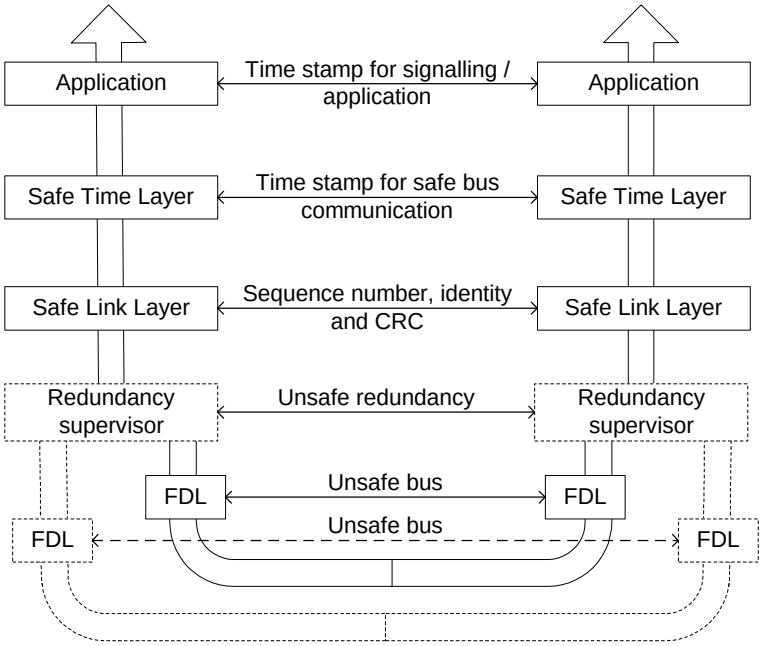


Figure 3 - FFFIS STM Protocol Layers

7. CONNECTION MANAGEMENT AND VERSION CHECK

7.1 General requirements linked to the opening of point-to-point connection between STM and ERTMS/ETCS on-board

7.1.1 Opening of the connection

7.1.1.1 A connection shall be considered as established when the version check is considered as completed and successful (see chapter 7.1.2).

7.1.1.2 The STM shall take the initiative to establish the connection.

7.1.1.3 When a STM has to establish a connection with an ERTMS/ETCS on-board function, and fails to establish the connection 2 times, it shall be allowed to retry the establishment of connection after 10 seconds.

7.1.2 Check of version

7.1.2.1 Each time the STM opens a connection with any ERTMS/ETCS on-board function, the STM shall send its “FFFIS STM version number” to this ERTMS/ETCS on-board function, followed by the STM state report information in the same application message.

7.1.2.2 When receiving the “FFFIS STM version number” from the STM, the concerned ERTMS/ETCS on-board function shall check the version compatibility as follows:

a) if the “FFFIS STM version number X” from the STM is lower than the lowest “FFFIS STM version number X” supported by the ERTMS/ETCS on-board equipment, the ERTMS/ETCS on-board function shall close the connection (final disconnection on Safety Layers).

b) if the “FFFIS STM version number X” from the STM is amongst the ones supported by the ERTMS/ETCS on-board equipment, the ERTMS/ETCS on-board function shall send to the STM the highest supported FFFIS STM version number of which the version number X is equal to the one received from the STM. The ERTMS/ETCS on-board function shall be allowed to transmit application data to the STM.

c) if the “FFFIS STM version number X” from the STM is greater than the highest version number X supported by the ERTMS/ETCS on-board equipment, the ERTMS/ETCS on-board function shall close the connection (final disconnection).

7.1.2.3 When receiving “FFFIS STM version number” from ERTMS/ETCS on-board, the STM shall check the version compatibility. If it is compatible with the “FFFIS STM version number” of the STM, then the version check is considered as terminated and successful. The STM shall be allowed to transmit further application data to the ERTMS/ETCS on-board function.

7.1.2.4 If the “FFFIS STM version number” of the ERTMS/ETCS on-board is not compatible with the “FFFIS STM version number” of the STM, then the STM shall close the connection (final disconnection) to the concerned ERTMS/ETCS on-board function.

7.1.3 Closing of the connection

7.1.3.1 Closing a connection on application layer shall be done by requesting the Safety Layers (see 6.6.1.2) to close the connection.

7.1.4 Connection Sequence Charts.

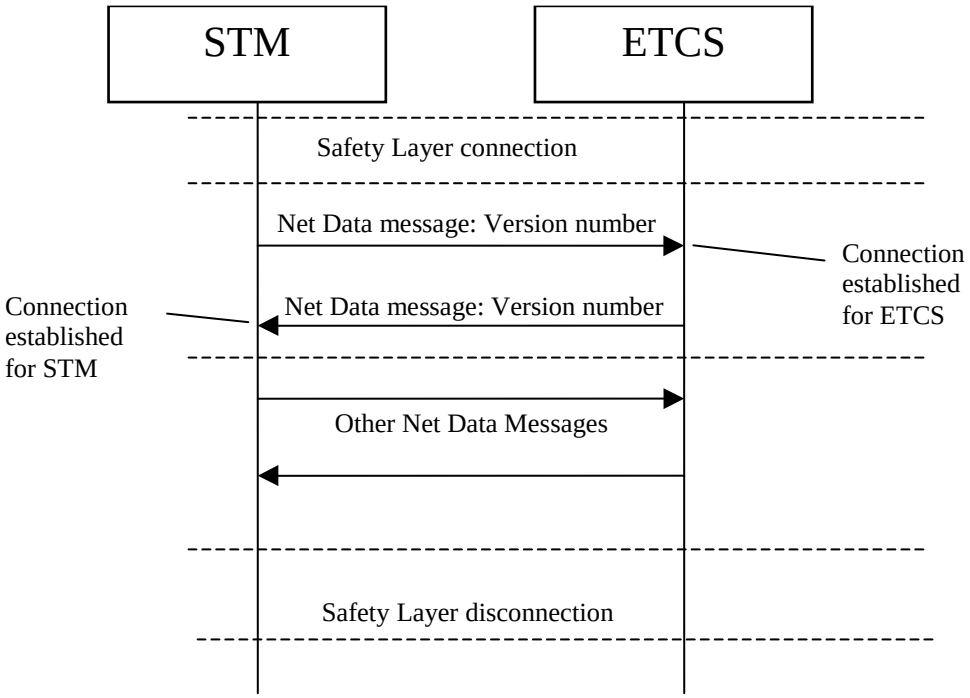


Figure 4 Nominal connection establishment sequence chart

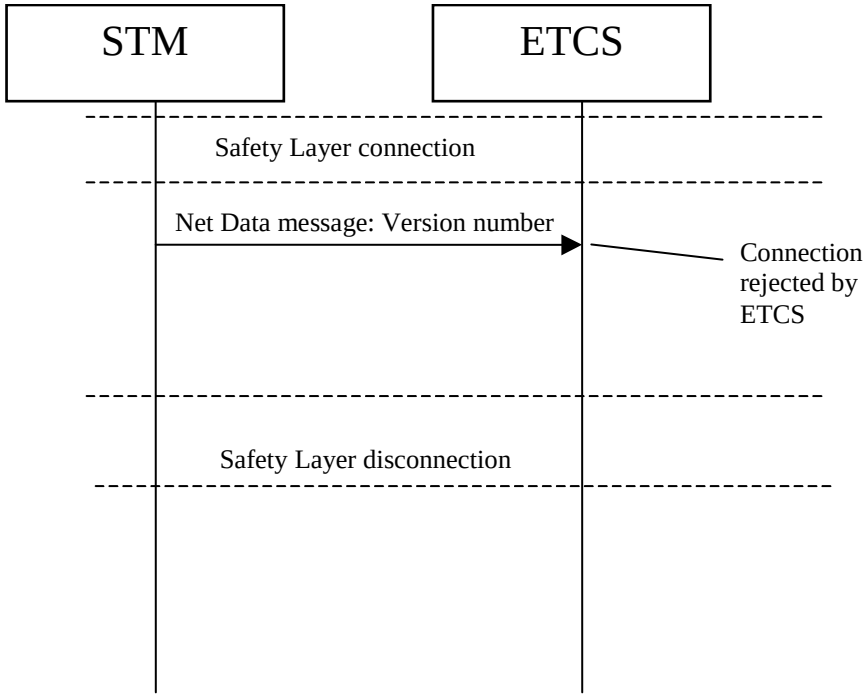


Figure 5 Bad version number disconnection sequence chart

7.2 General requirements linked to handling multicast connection

7.2.1.1 The multicast sender shall open a separate connection for all “FFFIS STM version numbers” defined in the Legal backward compatibility envelope (see table 16.3.1.1).

7.2.1.2 Note: For each multicast application connection (currently limited to Odometer Function), the table 6.5.1.5 contains one SAP for each “FFFIS STM version number”. This allows opening separate connections.

7.2.1.3 On each connection, the multicast sender shall transmit the corresponding “FFFIS STM version number” over the FFFIS STM. The transmission shall be repeated to support restarting STMs.

7.2.1.4 When receiving “FFFIS STM version number” from ERTMS/ETCS on-board, the STM shall check the version compatibility.

7.2.1.5 If the “FFFIS STM version number” of the ERTMS/ETCS on-board is not compatible with the “FFFIS STM version number” of the STM, then the STM shall ignore any information received from this multicast connection.

8. STM STATES

8.1 No Power (NP)

8.1.1.1 The NP state means that the STM is unpowered.

8.2 Power On (PO)

8.2.1.1 This state is the default state entered by the STM after the STM is switched on.

8.2.1.2 Once in PO state, the STM shall perform the synchronisation of the Safe Time Layer.

8.2.1.3 Once in PO state, the STM shall establish a connection with the ERTMS/ETCS on-board STM Control Function.

8.2.1.4 When the STM has established the connection to the STM Control Function, the STM shall send a “Specific NTC Data Need” information to the STM Control Function indicating whether it needs or not Specific NTC Data.

8.2.1.5 Once the ERTMS/ETCS on-board has sent the bus addresses and safety levels of all available ERTMS/ETCS on-board functions (see 10.1.1.4), it shall allow STM to establish connections with any of these functions.

8.2.1.6 Once the STM Control Function has sent the ETCS status data to an STM in PO state (see chapter 10.5.1.1), it shall allow this STM to request CO state.

8.3 Configuration (CO)

8.3.1.1 The STM CO state is used to wait until all configuration data between STM and ERTMS/ETCS on-board have been exchanged. “Configuration data” means data that is necessary for the national operation, except Specific NTC Data.

8.3.1.2 Configuration data from ERTMS/ETCS on-board to STMs consists of:

a) ETCS data (see chapter 10.4)

b) Status / availability of the train interface FFFIS STM signals (TIU)

c) Status / availability of the brake interface FFFIS STM signals (BIU)

d) Odometer performance parameters (see chapter 12.4)

e) Brake performance parameters: Maximum time delay for the ERTMS/ETCS on-board to process the STM Emergency and the STM Service Brake commands. This is the time from receiving the brake command from the STM until the ETCS commands the brake.

8.3.1.2.1 Note: Configuration data has not necessarily to be sent in CO state. Some data could be sent in PO state.

8.3.1.2.2 Note: The brake performance parameter can be used by the STM in braking curves calculation.

8.3.1.3 Once the transmission of configuration data is finished and the Specific NTC Data Entry procedure is started, if the STM does not require any Specific NTC Data, then the STM shall request Cold Standby state to the STM Control Function.

8.3.1.4 If an STM in Configuration State detects that the ERTMS/ETCS on-board is in the mode Non-Leading or Sleeping and has received all the configuration data except for the ETCS data, the STM shall request to go to Cold Standby state.

8.3.1.4.1 Justification: This allows STM operation in Non-Leading or Sleeping in which ETCS Train Data is not available.

8.3.1.5 Once the transmission of configuration data is finished and the Specific NTC Data Entry procedure is started, if the STM does require any Specific NTC Data, then the STM shall request Data Entry state to the STM Control Function.

8.3.1.6 When an STM exits CO state, it shall have the possibility to close any connection except with STM Control Function.

8.4 Data Entry (DE)

8.4.1.1 The state DE is used by any STM that requires Specific NTC Data in order to have all the required national information for operating the train with the STM.

8.4.1.1.1 Note: This state is only entered once at the start up process of the STM.

8.4.1.2 In the state DE, the Specific NTC Data Entry procedure (see chapter 10.7) shall be performed.

8.4.1.3 Once the Specific NTC Data Entry procedure is terminated, the STM shall request Cold Standby state to the STM Control Function.

8.4.1.4 Note: The Specific NTC Data Entry procedure can be terminated without having received the Specific NTC Data (e.g. when the Specific NTC Data Entry procedure is skipped). However, the Cold Standby state is still requested in order to have the same system behaviour when the Specific NTC Data is invalid.

8.5 Cold Standby (CS)

8.5.1.1 Being in the state CS, the STM has been initialised, tested (if required), configured and is in possession of all required information for operating, but is not able to receive a message from the trackside, because the reception is turned off.

8.5.1.1.1 Exception: Specific NTC Data could be invalid, see 10.7.3.3.

8.6 Hot Standby (HS)

8.6.1.1 Being in the state HS, the STM shall be able to process the information from or to the national trackside.

8.6.1.1.1 Note: In HS state, when receiving national trackside information, the STM treats this information to be prepared to take charge of the train movement supervision once it switches to Data Available state.

8.6.1.2 The STM in HS state shall have the possibility to send an “STM max speed” (V_STMMAX) to the ERTMS/ETCS on-board through the STM Control Function.

8.6.1.2.1 Note: This “STM max speed” is to allow the STM, for national reasons unknown to the ERTMS/ETCS on-board or ETCS Trackside, to request a given train speed at the level transition border in order to have a smooth transition.

8.6.1.3 The STM in HS shall have the possibility to send an “STM system speed” (V_STMSYS) together with an “STM system distance” (D_STMSYS) to the ERTMS/ETCS on-board through the STM Control Function.

8.6.1.3.1 Note: This “STM system speed” together with the “STM system distance” is sent to allow the STM, to request a given train speed at a given position (“STM system distance”) before the level transition border in order to be able to detect its national trackside.

8.6.1.4 When an STM in HS state receives an order to go in CS state, the STM shall have the possibility to close any connection except with STM Control Function.

8.7 Data Available (DA)

8.7.1.1 In DA state, an STM is responsible for the train movement supervision, according to the received national trackside information.

8.7.1.2 When an STM in DA state receives an order to go in CS state, the STM shall have the possibility to close any connection except with STM Control Function.

8.8 Failure (FA)

8.8.1.1 Being in this state, the STM is not able to work any more, due to internal or external reasons.

8.8.1.2 Being in this state, the STM shall not send messages any more on the bus except to report this state to the ERTMS/ETCS on-board functions.

9. STM MANAGER SYSTEM – REQUIREMENTS ON STM

9.1 Scope

9.1.1.1 The scope of this chapter is to define how the STM handles its state.

9.2 STM States transitions table

9.2.1.1 Transitions table for STM

NP	< 15	< 15	< 15	< 15	< 15	< 15	< 15
1 >	**PO**						
	2 >	**CO**					
		3 >	**DE**				
		4a >	4a >	**CS**	< 4a	< 4a < 4b	
				6 >	**HS**		
				9 >	9 >	**DA**	
	16 > 17 >	16 > 17 >	16 > 17 >	16 > 17 >	16 > 17 >	16 > 17 >	**FA**

9.2.1.2 Transitions conditions table

9.2.1.2.1 Note: This table only contains the event(s) that triggers the transition. It does not describe the reasons why this(these) event(s) happens. ETCS orders referred to below are described in chapter 10.3.2.

Condition Id	Content of the conditions
1	STM is powered on
2	ETCS order “Configuration”
3	ETCS order “Data Entry”
4a	ETCS unconditional order “Cold Standby”
4b	(ETCS conditional order “Cold Standby” has been received) AND (STM does not or no more report National Trip Procedure)
5	*intentionally deleted*
6	ETCS order “Hot Standby”
7	*intentionally deleted*
8	*intentionally deleted*
9	ETCS order “Data Available”

Condition Id	Content of the conditions
10	*intentionally deleted*
11	*intentionally deleted*
12	*intentionally deleted*
13	*intentionally deleted*
14	*intentionally deleted*
15	STM is powered off
16	ETCS order “Failure”
17	The STM decides itself to go in FA state

9.2.1.3 Note: As long as an STM in DA state is in a National Trip Procedure in SN mode, the STM sends cyclically the “National Trip Procedure” information to the STM Control Function in order to fulfil the timeout requirements defined in 10.3.2.4 (transitions E16 and F16). If the mode changes to TR, the STM is expected to enter CS state even if its National Trip Procedure is not finished, as the Trip procedure is handed over by ERTMS/ETCS on-board (otherwise, the STM would be ordered to FA state through transition Q16 once the TR mode is exited).

9.3 General STM requirements

9.3.1.1 The STM antenna shall not energise trackside equipment, and shall not read trackside data, and shall not transmit data to trackside, except:

a) in HS or DA state,

b) for test purpose.

9.3.1.2 If the STM receives from the ERTMS/ETCS on-board a state transition order, which is not allowed by the state transition table (9.2.1.2), then the STM shall go in FA state.

9.3.1.3 The STM shall report its NID_STM on all point-to-point connections with the ERTMS/ETCS on-board:

a) intentionally deleted

b) with each transmitted application message from the STM to the ERTMS/ETCS on-board function or DMI channel.

9.3.1.4 The STM shall report its current state on all point-to-point connections with the ERTMS/ETCS on-board:

a) intentionally deleted

b) with each transmitted application message from the STM to the ERTMS/ETCS on-board function or DMI channel, and

c) whenever the STM state is changed, while the connection to the respective ERTMS/ETCS on-board function or DMI channel is established.

9.3.1.4.1 Exception: The FA state shall be reported if possible. Due to a failure of the STM itself it may not be possible to report the FA state.

10. STM CONTROL FUNCTION

10.1 General requirements

10.1.1.1 It shall be possible to configure the ERTMS/ETCS on-board equipment with the list of STMs installed on-board.

10.1.1.2 The STM Control Function shall maintain a list of “available” STMs, which includes all STMs that have an established connection to the STM Control Function and report either CS, HS or DA state.

10.1.1.3 Level NTC X shall be considered as “Available for use” for level transition (see [1] paragraph 5.10.2.4.1) if the STM X associated to this level is available.

10.1.1.4 The STM Control Function shall send to the STM the following information when the connection to the STM is established:

a) The ERTMS/ETCS on-board functions that are available

b) The ETCS bus address of all available ERTMS/ETCS on-board functions

c) The safety level of all available ERTMS/ETCS on-board functions (see 6.2)

10.1.1.4.1 Note: Only Juridical Data and DMI channels 2, 3 & 4 can be marked as not available.

10.1.1.5 The STM Control Function shall inform the STM about the active DMI channel

a) whenever the active DMI channel changes,

b) whenever the connection to STM Control Function is established.

10.2 Association of STM X to Level NTC X

10.2.1.1 The ERTMS/ETCS on-board shall be configurable with a look-up table that gives the correspondence between NID_NTC values and the NID_STM values of the STM(s) fitted on-board. For each NID_NTC value within this look-up table, a list of one or several NID_STM values shall be configured, with a priority order.

10.2.1.1.1 Note: A National System can cover the functionalities of other National Systems having their own NID_NTC values. For that case, the look-up table is needed to map the NID_NTC values corresponding to these encapsulated National Systems to the NID_STM value(s) of the STM(s) fitted on-board supporting them. But an entry in the look-up table is not needed for the case there is a one-to-one relation between NID_NTC value and NID_STM value.

10.2.1.1.2 Throughout this document, “STM X” stands for “STM associated to Level NTC X”. This STM is not necessarily fitted on-board.

10.2.1.2 If Level NTC X (defined by its NID_NTC) is not already associated to an STM, the ERTMS/ETCS on-board shall associate this Level NTC X to STM X as follows:

a) When a level transition order to Level NTC X is accepted,

the STM X shall be the STM which NID_STM is equal to NID_NTC, if the level transition order is received from a trackside constituent with ETCS system version strictly lower than 2.0 or if the look-up table does not contain the NID_NTC value of Level NTC X.

Otherwise the STM X shall be the STM having the highest priority among the available STMs linked to the NID_NTC value in the look-up table. If there is no available STM linked to this NID_NTC value, the STM X shall be the STM having the highest priority among the STMs linked to this NID_NTC value.

b) When the ERTMS/ETCS on-board receives airgap data to be transmitted to an STM with the NID_NTC value of Level NTC X, the STM X shall be associated as for the level transition.

c) When the Level NTC X is selected/validated by driver,

the STM X shall be the STM which NID_STM is equal to NID_NTC, if the look-up table does not contain the NID_NTC value of Level NTC X.

Otherwise, the STM X shall be the STM having the highest priority among the available STMs linked to this NID_NTC value in the look-up table. If there is no available STM linked to this NID_NTC value, then the STM X shall be the STM having the highest priority among the connected STMs linked to this NID_NTC value and that are not considered as failed or seen as isolated. Otherwise, the STM X shall be the STM having the highest priority among the STMs linked to this NID_NTC value.

10.2.1.3 The association between a Level NTC X and an STM X shall be kept until the Level NTC X is left after having been entered, or until the Stand-By or No Power mode is entered.

10.2.1.3.1 Note: If STM X associated to the current Level NTC X is no more available, it remains associated to Level NTC X until one of these conditions is fulfilled, even if another STM supporting NTC X is available. This avoids that there is a change of active STM that is neither due to a level transition from trackside, nor due to a driver level selection/validation.

10.3 STM MANAGER SYSTEM

10.3.1 Scope

10.3.1.1 The present chapter does not specify the whole STM Control Function, but only the part of the STM Control Function that manages the states of the connected STM(s).

10.3.2 State transition orders

10.3.2.1 The STM Control Function STM state order table is a table that lists all the events that lead to a state order given by the STM Control Function to the STM.

10.3.2.2 STM state order table (ERTMS/ETCS on-board STM Control Function)

NP	< A15	< A15	< A15	< A15	< A15	< A15	< A15
A1 >	**PO**	< A1	< A1	< A1	< A1	< A1	< A1
	A2 >	**CO**					
		A3 >	**DE**				
		A4a >	A4a >	**CS**	< C4a < E4a < G4a < H4a < I4a < J4a	< B4a < B4b < I4a < A4b < E4a < K4a < L4a	
				A6 > B6 >	**HS**		
				A9>	A9 >	**DA**	
A17 > B16>	A16 > B16 > C16 > H16 > I16 > L16 > P16 > A17 >	A16 > B16 > C16 > H16 > I16 > O16 > P16 > A17 >	A16 > B16 > C16 > H16 > I16 > O16 > P16 > A17 >	A16 > B16 > C16 > D16 > H16 > N16 > O16 > P16 > A17 >	A16 > B16 > C16 > D16 > H16 > N16 > O16 > P16 > A17 >	A16 > B16 > C16 > E16 > F16 > H16 > N16 > O16 > P16 > Q16> A17 >	**FA**

10.3.2.3 The state indicated in table 10.3.2.2 corresponds to the last state report received from the STM or to FA state if an FA state order has been sent since the reception of the last state report. The STM Control Function shall consider the STM to be in NP when it has not received any state report from the STM.

10.3.2.4 STM state order conditions table applicable to STM X, associated to Level NTC X (ERTMS/ETCS on-board STM Control Function)

Condition Id	Content of the conditions
A1	(STM X connects to the STM Control Function) AND (STM X reports PO state)
A2	(“Request CO state” received from STM X)

Condition Id	Content of the conditions
A3	(“Request DE state” received from STM X) AND (ETCS Train Data is validated)
A4a	(“Request CS state” received from STM X)
B4a	(ERTMS/ETCS on-board performs a level transition ordered by the trackside from Level NTC X to Level 0, 1, 2, 3)
C4a	(announcement for a transition to Level NTC X is stored) AND (STM X reports HS state) AND (a level transition order to Level NTC Y is received before the transition to Level NTC X) AND (STM X is different from the STM Y associated to Level NTC Y)
B4b	(The driver manually changes the level from Level NTC X to Level NTC Y) AND (STM X is different from the STM Y associated to Level NTC Y)
E4a	(ETCS mode changes to SB)
G4a	(STM X reports “HS state”) AND (no transition to any level associated to STM X for further location is stored on-board) AND (Override function is not active) AND (ETCS level is different from any level associated to STM X)
H4a	(ETCS mode is SB) AND (No cab is active)
I4a	(ETCS mode changes to SH)
J4a	(announcement for a transition to Level NTC X is stored) AND (STM X reports HS state) AND (a level transition order to Level 0, 1, 2 or 3 is received before the transition to Level NTC X)
K4a	(The driver manually changes the level from Level NTC X to Level 0, 1, 2 or 3)
L4a	(ETCS mode changes to TR)
A4b	(ERTMS/ETCS on-board performs a transition ordered by the trackside from Level NTC X to Level NTC Y) AND (STM X is different from the STM Y associated to Level NTC Y)
A6	(A transition to Level NTC X for a further location is stored on-board) AND (STM X reports CS state) AND (no other STM reports HS state)
B6	(ETCS mode is SB) AND (Cab is active) AND (valid level of the ERTMS/ETCS on-board is Level NTC X) AND (STM X reports CS state) AND (no other STM reports HS state)
A9	(level of the ERTMS/ETCS on-board is Level NTC X) AND (STM X reports CS or HS state) AND (no other STM reports DA state) AND (ETCS mode is SN, SL or NL)
A15	(the ERTMS/ETCS on-board equipment is NOT powered)
A16	(the STM Control Function receives from STM X a state request which is not allowed by the state transition table)
B16	(STM X reports a state it must not be in according to table 9.2.1.1)
C16	(the STM Control Function has sent a state transition order except “DA state transition order” and except “conditional CS state transition order”) AND (STM X does not report the required state within a maximum delay time of 10 seconds)

Condition Id	Content of the conditions
D16	(the STM Control Function has sent a “DA state transition order”) AND (STM X does not report the required state within a maximum delay time of 5 seconds)
E16	(the STM Control Function has sent a “conditional CS state transition order”) AND (STM X does not report CS state or send a “National Trip Procedure” information within a maximum delay time of 10 seconds)
F16	(the STM Control Function has sent a “conditional CS state transition order”) AND (the STM Control Function has already received a “National Trip Procedure” information from STM X) AND (STM X does not report CS state or send a “National Trip Procedure” information within a maximum delay time of 10 seconds)
H16	(a final disconnection between the ERTMS/ETCS on-board STM Control Function and STM X was detected (see [3] and [2]))
I16	(The ERTMS/ETCS on-board performs a transition ordered by trackside to Level NTC X) AND (STM X is not available)
L16	(STM X has not yet sent the Specific NTC Data Need) AND (STM X requests CO state)
N16	(The timeout TrainDataView_STM_Response_Timeout for STM X has expired)
O16	(The timeout TrainDataEntry_STM_Response_Timeout for STM X has expired)
P16	(A safety-related information has not been transmitted to STM because of disconnection)
Q16	(“National Trip Procedure” is active) AND (STM X reports again “National Trip Procedure” information) AND (the current ETCS mode is PT or UN)
A17	(STM X reports FA state)

10.3.2.5 Note: The delay is shorter for transition to DA state because this transition is assumed as the most critical one from a safety aspect.

10.3.2.6 When the conditions to change the STM state within the STM Control Function are valid according to 10.3.2.2 and 10.3.2.4, the STM Control Function shall send the corresponding state transition order to STM X.

10.3.2.6.1 Exception 1: The STM Control Function shall not send an order for NP or PO state.

10.3.2.6.2 Exception 2: The STM Control Function shall not send an order for FA state if the STM has reported FA state (transition A17).

10.3.2.7 When the state transition order is going to CS state, the STM Control Function shall send an “unconditional order CS state” for the transitions A4a, B4a, C4a, E4a, G4a, H4a, I4a, J4a, K4a and L4a, and a “conditional order CS state” for the transitions A4b and B4b.

10.3.2.8 Note about Q16 condition: The Trip mode is entered if the STM X is in National Trip Procedure when a transition to level 0, 1, 2 or 3 occurs. The National Trip Procedure

may still be reported after this transition in case the STM has been ordered to CS with a conditional order due to a previous level transition from NTC X to NTC Y.

10.3.3 Requirements linked to state transition orders and state reports

10.3.3.1 The STM Control Function shall not evaluate the state transition order conditions, except conditions to FA state, if this STM has not reported the state corresponding to the last state transition order.

10.3.3.2 An STM is considered as active by the ERTMS/ETCS on-board from the moment it has sent the DA state order to the STM until it sends another state order to this STM (except “conditional CS state transition order”) or receives a state report different from DA from this STM.

10.3.3.3 The STM Control Function shall command the emergency brake from the moment a “conditional CS state transition order” has been sent to a STM and this STM is in National Trip Procedure, up to the moment this STM reports CS state, or is considered as failed and the train reaches standstill.

10.3.3.3.1 Note: This brake command avoids that the train could run untimely without supervision, in case the active STM does not send a brake command but still sends its National Trip Procedure which delays the activation of the STM of the newly entered area.

10.3.3.4 The STM Control Function shall apply the emergency brake when the level is NTC X and the mode is SN and STM X is known as installed on-board but not available.

10.3.3.5 Exception: the brake shall not be applied in case the STM X is known to be isolated, through the corresponding input on the Train Interface.

10.3.3.6 The emergency brake application shall be released by the STM Control Function when

a) the STM X has established the connection to the STM Control Function after a non-final disconnection and the reported STM X state is DA,

b) or the level changes to Level 0, 1, 2, 3,

c) or the level changes to a Level NTC Y that is not associated to STM X,

d) or the mode SN is left with no change of level,

e) or the dedicated input on the Train Interface informs the ERTMS/ETCS on-board that the STM X is isolated.

10.3.3.7 The ERTMS/ETCS on-board shall accept the reconnection of an STM not considered as in FA state or reporting PO state, except in case of final disconnection on Safety Layers.

10.3.3.8 The STM Control Function shall inform the driver that the STM X is not available while all of the following conditions are fulfilled

- the level is NTC X,
- and (the mode is SN) or (the mode is NL and has been so for at least 5s),
- and STM X is known as installed on-board but not available,

- and STM X is not known to be isolated through the corresponding input on the Train Interface.

10.3.3.8.1 Note: the 5s delay on the information to the driver is required because the STM X requests to enter in CS state only after the mode has changed to NL.

10.4 ETCS data

10.4.1.1 The ETCS data transmitted by the ERTMS/ETCS on-board to the STMs shall include a subset of the ETCS Train Data (defined in [1]), as listed below:

a) Train category(ies)

b) Train length

c) Traction / brake parameters

d) Maximum train speed

e) Loading gauge

f) Axle load category

g) Traction system(s) accepted by the engine

h) Train fitted with airtight system

10.4.1.2 The ETCS data transmitted by the ERTMS/ETCS on-board to the STMs shall include a subset of the ETCS Train Data entry input fields (defined in [9]), as listed below:

a) Train Type, if applicable for the train

10.4.1.3 Note: Extra data for the available STMs are handled in the Specific NTC Data Entry procedure see chapter 10.7.

10.4.1.4 The traction / brake parameters shall include:

a) Equivalent brake build up time for full service brake for the combination of none of the special brakes being used

b) Equivalent brake build up time for emergency brake for the combination of none of the special brakes being used

c) Traction cut off time

d) Brake position

e) Brake percentage, if applicable for the train

10.4.1.5 The ETCS data transmitted by the ERTMS/ETCS on-board to the STMs shall include a subset of ETCS Additional Data (defined in [1]) as listed below:

a) Train Running Number

b) ETCS identity

c) Adhesion factor

d) Date and Time (UTC Time)

10.4.1.6 The ETCS data transmitted by the ERTMS/ETCS on-board to the STMs shall include the ETCS National / Default Values (defined in [1])

10.4.1.7 The STM Control Function shall transmit the subset of valid ETCS Train Data when the ETCS Train Data is validated.

10.4.1.7.1 Note: ETCS Train Data could be changed and validated from sources different from the driver if acquired from ERTMS/ETCS on-board external sources.

10.4.1.8 The STM Control Function shall transmit the valid ETCS Additional Data

a) when the STM has entered into Configuration (CO) state, and

b) when the valid ETCS Additional Data except date / time has changed.

10.4.1.9 The STM Control Function shall transmit the currently used ETCS National / Default Values

a) when the STM has entered into Configuration (CO) state, and

b) when the currently used ETCS National Values have changed (this also includes the case when the National Values are reset to the Default Values).

10.5 ETCS status data

10.5.1.1 The STM Control Function shall send the ETCS status data consisting of the current ETCS mode and level (defined in [1]):

a) To all connected STMs whenever the ETCS mode or level changes.

b) To any STM when the connection to the STM Control Function is established.

10.6 Language used to display information to the driver

10.6.1.1 The STM Control Function shall transmit the language used to display information to the driver:

a) To all connected STMs whenever the language is changed,

b) To any STM when the connection to the STM Control Function is established.

10.7 Specific NTC Data Entry

10.7.1 Definitions

10.7.1.1 The “Specific NTC Data” are the national data that need to be requested to the driver.

10.7.1.2 The STM may use the transmitted ETCS data: ETCS Train Data, ETCS Additional Data and ETCS National Values in order to reduce the entry of “Specific NTC Data” by the driver.

10.7.1.3 All “Specific NTC Data” used by all the different STMs are assigned a unique identity made of NID_STM and Data Identifier.

10.7.1.4 The process to deliver those “Specific NTC Data” to the STM is called “Specific NTC Data Entry”.

10.7.1.4.1 Note: Specific NTC Data Entry is possible at start-up and later on during mission through the Train Data Entry procedure.

10.7.2 Responsibilities

10.7.2.1 The ERTMS/ETCS on-board equipment is responsible for the dialogue with the driver during the Specific NTC Data Entry/Validation process, for checking the technical range checks (if configured on-board) and for the transmission of the Specific NTC Data after the driver’s validation.

10.7.2.2 The STM is responsible for checking the content (e.g. range, spares, internal dependency of parameters) of the data. The STM can be exempted of technical range checks if those are configured in the ERTMS/ETCS on-board equipment.

10.7.3 General requirements

10.7.3.1 The ERTMS/ETCS on-board equipment shall offer the possibility to the driver to skip the Specific NTC Data Entry for a STM.

10.7.3.2 The ETCS Train Data as well as the Specific NTC Data might become invalid within the STM at any time due to national requirements. In this case, the STM may request the data from the ETCS by sending the “Specific NTC Data Need”.

10.7.3.3 Specific NTC Data can be or become invalid, because:

a) the ETCS Train Data Entry/Specific NTC Data Entry procedure has not yet been performed or has been aborted, or

b) the driver has skipped the Specific NTC Data Entry for this STM before the STM has sent the “End of Specific NTC Data Entry” to the ERTMS/ETCS on-board, or

c) the ETCS Train Data Entry procedure has already been performed by the time the STM has entered into CO state, e.g. the STM has been powered on or restarted during train mission, or

d) the ETCS Train Data has changed from sources different from the driver and this change impacts the validity status of the Specific NTC Data, according to national rules, or

e) because of STM internal function, e.g. national shunting.

10.7.3.4 When the ERTMS/ETCS on-board receives the “Specific NTC Data Need” while in FS, LS, SR, OS, UN, TR, PT and SN modes, it shall inform the driver that the national system needs data.

10.7.3.5 The ERTMS/ETCS on-board shall delete this information to the driver when the driver initiates the Train Data entry procedure or when the corresponding STM is considered as failed or when this STM is known to be isolated by TIU “NTC isolation status” input data.

10.7.3.6 The STM requests its Specific NTC Data with a “Specific NTC Data Entry request” which shall include for each Specific NTC Data, the following information: the label, optionally a default value, and optionally values for a dedicated keyboard.

10.7.3.7 Note: Unless values for a dedicated keyboard are provided or the type of keyboard is configured on-board, an alphanumeric keyboard will by default be used (see document ref [9]).

10.7.3.8 It shall be possible to configure in the ERTMS/ETCS on-board the following parameters for any STM:

1) The window titles for the NTC data entry, the NTC data validation and the NTC data view windows
2) For each Specific NTC Data Identifier not using a dedicated keyboard:
    a) The type of keyboard amongst numeric, enhanced numeric and alphanumeric
    b) If the type of keyboard is numeric or enhanced numeric, whether leading zeros have to be kept and sent to the STM
    c) The allowed minimum and maximum value, that shall be used by the ERTMS/ETCS on-board with a technical range check

10.7.3.9 By analogy to the modification/revalidation of ETCS Train data, the [1] requirements 3.14.1.7.3, 3.18.3.3.1 regarding the brake command/release when a movement is detected while modifying or revalidating the Train Data in normal operation after the start of mission shall also apply for the NTC data modification/revalidation.

10.7.4 Specific NTC Data Entry procedure

10.7.4.1 As soon as the ETCS Train Data is validated by the driver and if the connected STM is in CO, DE, CS, HS or DA state, the ERTMS/ETCS on-board shall indicate to the STM the beginning of its Specific NTC Data Entry procedure by sending the START flag.

10.7.4.2 The ETCS Train Data shall be sent immediately after the START flag.

10.7.4.3 While a Specific NTC Data Entry is ongoing, the ERTMS/ETCS on-board shall indicate to the STM the end of its Specific NTC Data Entry procedure by sending the STOP flag when one of the following conditions is fulfilled:

a) after having received the “End of Specific NTC Data Entry” from the respective STM,

b) at expiration of the timeout specified in 10.7.4.9 for the respective STM,

c) when the Train Data Entry procedure is aborted by the ERTMS/ETCS on-board for reasons not related to the STM interface

d) the Specific NTC Data Entry for this STM has been skipped by the driver see 10.7.3.1.

10.7.4.3.1 Note: Reasons leading to the abortion of the Train Data entry procedure and not related to the STM interface can be e.g. the cab deactivation, the driver aborting the Train Data entry procedure,...

10.7.4.4 Note: ETCS Train Data is also sent without the START and STOP flags outside a Train Data entry procedure, see 10.4.1.7.

10.7.4.5 Once the STM has received the ETCS Train Data while its Specific NTC Data Entry is ongoing:

a) If the STM requires Specific NTC Data, the STM shall send a “Specific NTC Data Entry request” information to the ERTMS/ETCS on-board.

b) If the STM doesn’t require Specific NTC Data, the STM shall send an “End of Specific NTC Data Entry” information to the ERTMS/ETCS on-board.

10.7.4.6 After the ERTMS/ETCS on-board has received the Specific NTC Data Entry request, it shall perform the Specific NTC Data Entry/Validation exchanges with the driver when the driver selects this Specific NTC Data Entry.

10.7.4.7 Once the Specific NTC Data for an STM has been validated by the driver, the ERTMS/ETCS on-board shall send the “Specific NTC Data” to this STM.

10.7.4.8 When the STM receives the Specific NTC Data, it checks the data according to its national criteria. Depending on the check result:

a) the STM shall send an “End of Specific NTC Data Entry” if the checks are OK and the STM has all the requested data.

b) the STM shall send again Specific NTC Data Entry request.

10.7.4.9 For all connected STMs, the ERTMS/ETCS on-board shall supervise separately a timeout of 10s (TrainDataEntry_STM_Response_Timeout, see chapter 10.3.2.4, O16):

a) from sending the ETCS Train Data by the ETCS while the Specific NTC Data Entry procedure is running, until the reception of a Specific NTC Data Entry request or the “End of Specific NTC Data Entry” from the STM and

b) from each sending Specific NTC Data by the ETCS until the reception of the Specific NTC Data Entry request or the “End of Specific NTC Data Entry” from the STM.

10.7.5 Sequence diagrams for the Specific NTC Data Entry

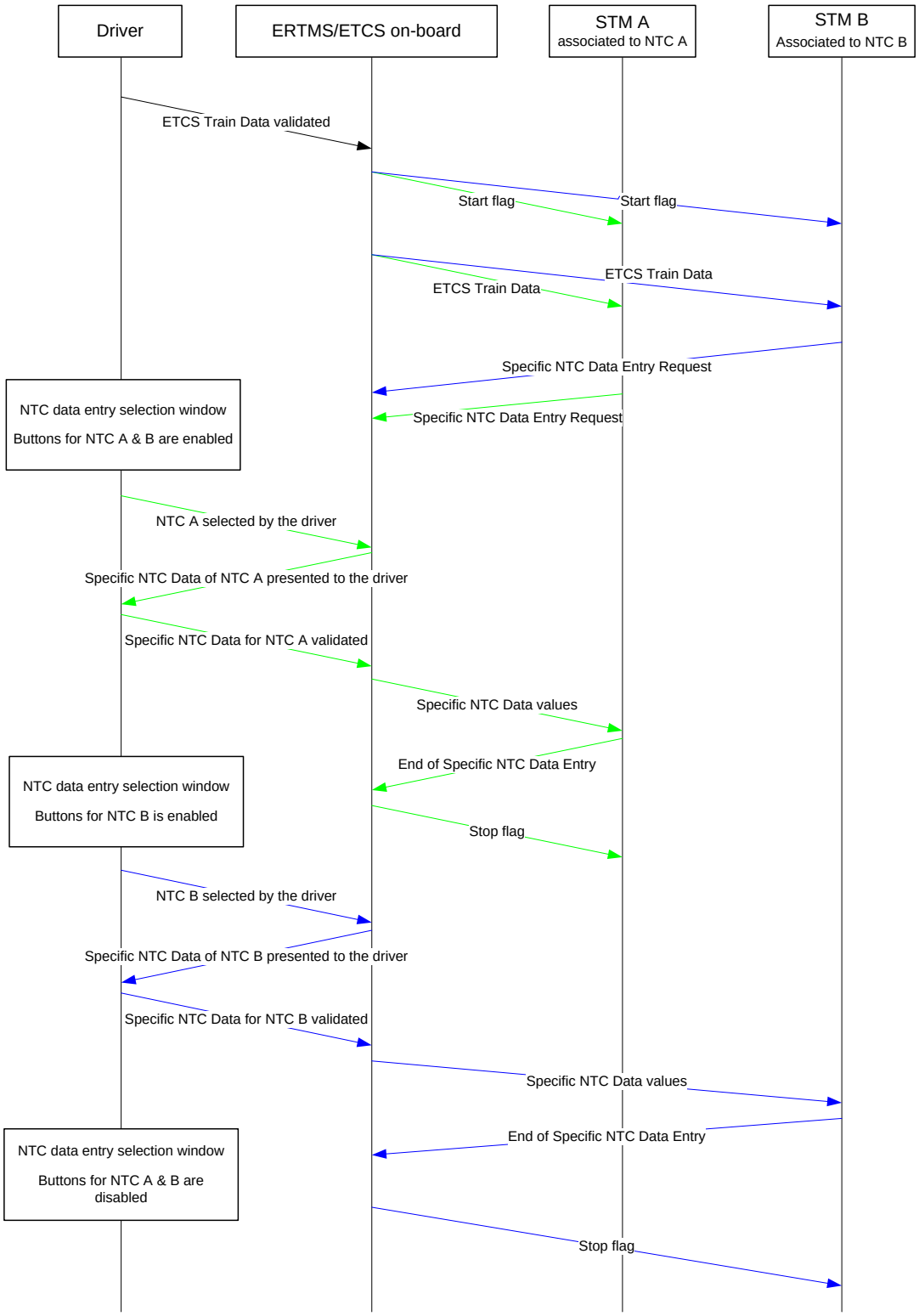


Figure 6 – Specific NTC Data Entry performed

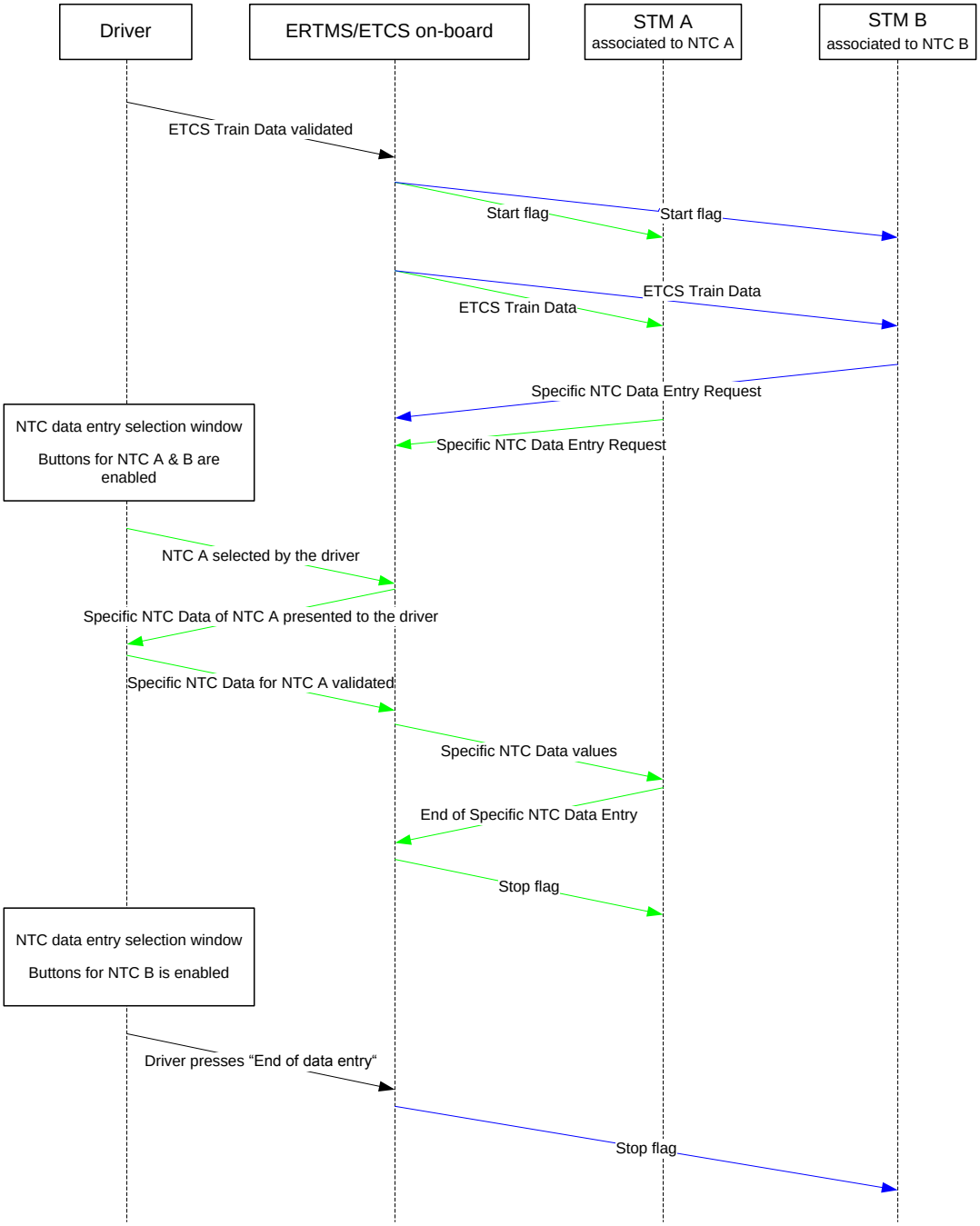


Figure 7 – Specific NTC Data Entry skipped for NTC B

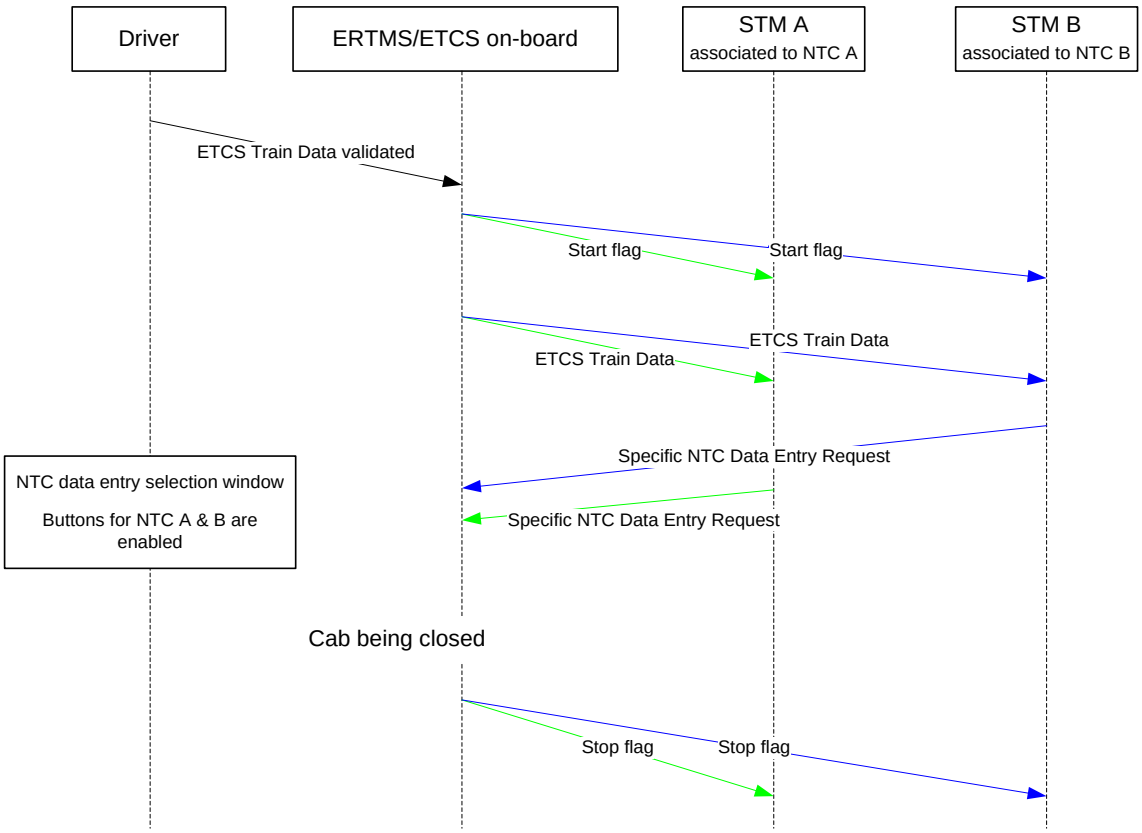


Figure 8 – Specific NTC Data Entry aborted

10.8 Specific NTC Data View

10.8.1.1 This procedure shall allow the driver to view the Specific NTC Data View values currently known by the STM.

10.8.1.2 When the Data View procedure is triggered, the ERTMS/ETCS on-board shall send to all available STMs a Request for Specific NTC Data View values.

10.8.1.3 Once the STM has received the ETCS Request for Specific NTC Data View values:

a) If the STM requires Specific NTC Data View values to be displayed, the STM shall send those Specific NTC Data View values (labels and corresponding values) to the STM Control Function.

b) If the STM doesn't require Specific NTC Data View values to be displayed, the STM shall send a "No Specific NTC Data View values" to the ETCS STM Control Function.

10.8.1.4 When the ERTMS/ETCS on-board receives the Specific NTC Data View values, it shall present them to the driver.

10.8.1.5 For all connected STMs, the ERTMS/ETCS on-board shall supervise separately a timeout of 10s (TrainDataView_STM_Response_Timeout, see chapter 10.3.2.4, N16) from sending the Request for Specific NTC Data View values until the reception of Specific NTC Data View values or the "No Specific Data View values" information from the respective STM.

10.9 STM Test Procedure

10.9.1.1 The STM shall be allowed to send a Test Procedure Permission Request, including a Test Identity, to the STM Control Function.

10.9.1.2 Having received this Test Procedure Permission Request, the ERTMS/ETCS on-board shall grant Test Procedure Permission when technically suitable.

10.9.1.2.1 Note: the condition to grant this Test Procedure Permission is specific to ERTMS/ETCS on-board implementation and to the Test Identity requested by the STM.

10.9.1.3 Having received this Test Procedure Permission, the STM shall perform the test and then report the End of Test Procedure, including test result and optional text message.

10.9.1.3.1 Note: the way the test result and text message are displayed is specific to ERTMS/ETCS on-board implementation.

10.10 Override

10.10.1 Introduction

10.10.1.1 This Override procedure (Trip Inhibition, Pass Stop or Pass signal at danger) is specified in order to provide an override for the active system as well as for the system to be activated without applying the brakes (e.g. trip) by both systems.

10.10.1.2 When Override is activated in the active system (ERTMS/ETCS on-board or STM), all on-board systems receive a notification. Each system can then activate and monitor its specific Override procedure limits (e.g. time, distance and/or reception of trackside information) and trip inhibition. Termination of this monitoring is done independently in each system.

10.10.1.3 After a level transition, the activated system is able to immediately have its Override function active. It can then start to supervise the relevant speed for Override under the limits of the activated system according to its specific requirements. The limits may be considered from the location where driver requested Override.

10.10.2 Requirements

10.10.2.1 In addition to the conditions defined in [1], the ETCS Override status shall be activated when in level NTC, the ERTMS/ETCS on-board has received from the active STM the activation report of its own Override procedure.

10.10.2.2 The ETCS Override function shall be reset each time a new activation report is received from the active STM.

10.10.2.3 The ERTMS/ETCS on-board shall report its Override status (activated or deactivated):

a) To any STM with an established connection to the STM Control Function whenever its Override status changes,

b) To any connecting STM when the connection to the STM Control Function is established.

10.10.2.4 Note: If the Override function is active while in the Mode SN, no speed supervision is performed by the ERTMS/ETCS on-board and all connected STMs except for the active STM.

10.11 Transmission of ETCS airgap messages for STMs

10.11.1.1 When the ERTMS/ETCS on-board receives from an RBC or from a Balise Group as non-infill information airgap data to be transmitted to an NTC, the data shall be transmitted by the STM Control Function to the STM associated to the Level NTC which NID_NTC is contained in this airgap data.

10.11.1.1.1 Note: Airgap data received as infill information is not transmitted to STMs.

10.11.1.2 The STM Control Function shall add to the transmitted airgap data the odometer reading of the balise group which transmitted the airgap message, or the odometer reading of the LRBG of the message if it was received from RBC.

10.11.1.3 The odometer reading shall correspond to the estimated odometer value of the location reference of the balise group.

10.12 STM max speed and STM system speed/distance

10.12.1 After announcement, but before the transition to Level NTC X

10.12.1.1 When an “STM max speed” (V_STMMAX) from STM X in HS state is accepted, the ERTMS/ETCS on-board includes the “STM max speed” in the computation of the MRSP (see [1] 4.5.2) as a speed restriction that shall start at the level transition border.

10.12.1.2 When the ERTMS/ETCS on-board accepts a new “STM max speed” (V_STMMAX) from STM X, the ERTMS/ETCS on-board shall replace the previously received “STM max speed” (V_STMMAX) with the new value.

10.12.1.3 If the STM X connected or known as installed on-board (see 10.1.1.1) is not available, then the ERTMS/ETCS on-board shall consider that “STM max speed” = 0.

10.12.1.3.1 Note: The purpose of the above requirement is to try to prevent the train to enter in a Level NTC area while this STM is not available.

10.12.1.4 When an “STM system speed” (V_STMSYS) together with an “STM system distance” (D_STMSYS) from STM X in HS state is accepted, the ERTMS/ETCS onboard includes the “STM system speed” (V_STMSYS) into the computation of the MRSP (see [1] 4.5.2), as a new speed restriction that shall start at a location “STM system distance” (D_STMSYS) in rear of the level transition border and shall end at the level transition border.

10.12.1.5 When an ERTMS/ETCS on-board accepts a new “STM system speed” (V_STMSYS) and “STM system distance” (D_STMSYS) from STM X, the ERTMS/ETCS on-board shall replace previously received “STM system speed” (V_STMSYS) and “STM system distance” (D_STMSYS) with the new value.

10.12.1.6 When the level transition announcement to level NTC X is deleted by the ERTMS/ETCS on-board:

a) The “STM system speed” (V_STMSYS) shall be deleted and the supervision of the “STM system speed” (V_STMSYS) shall be stopped by the ERTMS/ETCS on-board;

b) The “STM max speed” (V_STMMAX) shall be deleted and the supervision of the “STM max speed” (V_STMMAX) shall be stopped by the ERTMS/ETCS on-board.

10.12.1.6.1 Note: when a new level transition to another level than NTC X is accepted, the previous one is deleted and replaced with this new one.

10.12.1.6.2 Note: when a level transition announcement to the same level NTC X is updated (i.e. with a new distance), the "STM system speed" and "STM max speed" are not deleted.

10.12.2 After the level transition to Level NTC X

10.12.2.1 Once the train has passed the level transition border, the ERTMS/ETCS on-board shall supervise the “STM max speed” (V_STMMAX) previously sent by the STM in HS state as ceiling speed until the STM DA state report is received by the ERTMS/ETCS on-board.

10.12.2.2 If the STM is considered to be in FA state by the ERTMS/ETCS on-board after the level transition border, then the ERTMS/ETCS on-board shall stop the supervision of “STM max speed” (V_STMMAX).

10.12.2.3 If, for any reasons (e.g. reception of a level transition order or a manual change of level), the level changes to another level than NTC X, the “STM max speed” (V_STMMAX) shall be deleted and the supervision of the “STM max speed” (V_STMMAX) shall be stopped by the ERTMS/ETCS on-board.

10.13 Validity of “National Trip Procedure” information

10.13.1.1 The ERTMS/ETCS on-board shall consider that a National Trip Procedure is active if the “National Trip Procedure” packet has been received within the last 10 seconds (see [1]).

10.13.1.2 Note: if the National Trip Procedure has been released before a level transition, the ERTMS/ETCS on-board will consider it as still active for a maximum of 10 seconds after the reception of the information, but it is assumed that the level transition after the end of this National Trip Procedure won’t happen within this time, as the train is at standstill.

10.14 Display of STM failure status

10.14.1.1 When an STM has reported FA state or is commanded to FA state, the ERTMS/ETCS on-board shall inform the driver about the failed status of the national system supported by this STM.

10.14.1.2 When at Start of Mission just after validation of ETCS Train Data an STM known by ERTMS/ETCS on-board configuration to be installed is not in CO, CS, HS or DA state and this STM is not known to be isolated by TIU “NTC isolation status” input data,

ERTMS/ETCS on-board shall inform the driver about the failed status of the national system supported by this STM.

10.15 Interface 'K' Antenna/BTM ID

10.15.1.1 If the ERTMS/ETCS on-board uses alternative 1 of interface 'K' (see [10]), it shall indicate to all KER (KVB, Ebicab, RSDD) STMs whether it can or not guarantee by its own that the interface 'K' data is coming from the intended Antenna/BTM, when the connection to the STM Control Function is established.

10.15.1.2 If ERTMS/ETCS on-board cannot guarantee by its own that the interface 'K' data is coming from the intended Antenna/BTM, the STM Control Function shall inform whether there is an active Antenna/BTM and, if so, which one:

a) To all connected KER STMs whenever this information changes,

b) To any KER STM when the connection to the STM Control Function is established.

10.15.1.3 Note: This information enables an STM using interface 'K' to fulfil a requirement of [10] asking to supervise that the interface 'K' information comes from the intended source.

10.16 BTM alarm data

10.16.1.1 The STM Control Function shall send the BTM alarm data consisting of the BTM alarm status and whether the antenna is within an announced Big Metal Mass track condition:

a) To all connected STMs whenever the BTM alarm status changes or whenever an announced Big Metal Mass track condition is entered or exited during a BTM alarm,

b) To any STM when the connection to the STM Control Function is established.

10.16.1.2 Note: The ERTMS/ETCS on-board always sends this information over the FFFIS STM interface regardless the alarms are ignored according to [1] 3.12.1 and 3.15.7.

11. TIU AND BIU FUNCTIONS

11.1.1.1 The TIU Function shall transmit train interface inputs status / availability :

a) To any STM with an established connection to the TIU Function whenever a train interface inputs status / availability changes.

b) To any connecting STM when the connection to the TIU Function is established.

11.1.1.1.1 The TIU Function shall transmit train interface commands configuration to any connecting STM when the connection to the TIU Function is established.

11.1.1.2 The BIU Function shall transmit the brake performance parameters to any connecting STM when the connection to the BIU Function is established.

11.1.1.3 The BIU Function shall transmit the brake status / availability :

a) To any STM with an established connection to the BIU Function whenever a brake status / availability changes.

b) To any connecting STM when the connection to the BIU Function is established.

11.1.1.4 When the service brake is commanded by an STM, the STM shall indicate in its request if the service brake shall be backed up automatically by the ERTMS/ETCS on-board with an Emergency Brake command if the service brake fails to be applied.

11.1.1.4.1 Note: If it is not the case, this has to be considered as an exception to [1].

12. ODOMETER FUNCTION

12.1 General

12.1.1.1 The FFFIS STM specifies the odometer information to be transmitted from ERTMS/ETCS on-board to all STMs via FFFIS STM.

12.1.1.2 The ERTMS/ETCS on-board shall transmit odometer information via the FFFIS STM interface at regular intervals. This information shall include current values of estimated distance, direction, estimated speed, confidence interval of measurement of distance (i.e. minimum and maximum distances) and confidence interval for speed (i.e. minimum and maximum speeds).

12.1.1.3 Every transmitted odometer information report shall be time stamped. The time base for timestamp shall be the Reference Time obtained from the Safe Time Layer, see 5.2.2. The time in the timestamp shall be the time when the odometer data were valid.

12.1.1.3.1 Justification: this time information allows an STM to extrapolate distance and speed to fit its algorithms and processing cycles.

12.1.1.4 Positive movement direction is defined as a movements in the forward direction in relation to cab A. It shall be indicated with positive speed and increasing odometer distance values.

12.1.1.5 Negative movement direction is defined as movements in the backwards direction in relation to cab A. It shall be indicated with negative speed and decreasing odometer distance values.

12.1.1.5.1 Note: Allocation of cab(s) on a specific train is a pure ERTMS/ETCS on-board implementation issue.

12.1.1.6 The ERTMS/ETCS on-board shall not reset the odometer distance values as long as the ERTMS/ETCS on-board is powered-on.

12.1.1.6.1 Justification: The ETCS odometer information is used as a common reference within the FFFIS STM.

12.1.1.7 The ERTMS/ETCS on-board shall transmit odometer configuration data (see chapter 12.4) to the STMs.

12.2 Speed

12.2.1.1 **Estimated speed, V_Est,** shall be the estimated speed as used by the ERTMS/ETCS on-board (also referred as the train speed in [1]).

12.2.1.2 **Maximum speed, V_Max,** is defined as the most positive speed, i.e. the highest possible physical speed including under-reading amount, in case of movement in positive direction (V_Max = V_Est + |V_ura|). For movements in negative direction

V_Max reports the lowest possible speed in absolute value, i.e. including over-reading amount (V_Max = V_Est + |V_ora|).

12.2.1.3 **Minimum speed, V_Min,** is defined as the most negative speed, i.e. the lowest possible physical speed including over-reading amount, in case of movement in positive direction (V_Min = V_Est - |V_ora|). For movements in negative direction V_Min reports the highest possible speed in absolute value, i.e. including under-reading amount (V_Min = V_Est - |V_ura|).

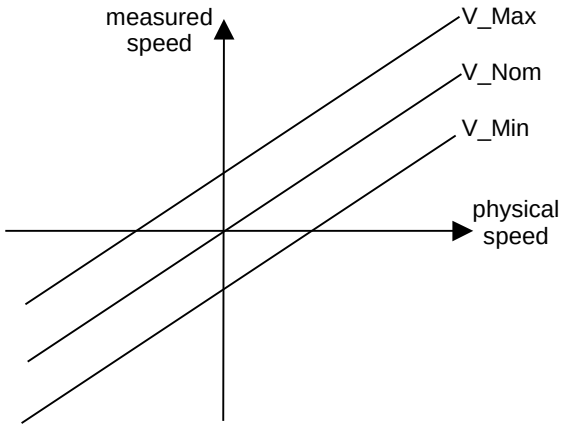


Figure 9 – Example of transmitted speed information

12.3 Distance

12.3.1.1 The estimated distance, **D_Est**, shall be the most probable position of the vehicle in the vehicle coordinate system at the time given in the odometer packet, with reference to the vehicle position at the last reset of the odometry.

12.3.1.2 Note: For any train movement, the most probable distance travelled between any two track positions can be computed as the difference between the measurement values of D_Est at the two positions.

12.3.1.3 **D_Max** is defined as the most positive position of the vehicle in the vehicle coordinate system at the time given in the odometer packet, with all over- and under-reading amounts accumulated since the last reset of the odometry.

12.3.1.4 **D_Min** is defined as the most negative position of the vehicle in the vehicle coordinate system at the time given in the odometer packet, with all over- and under-reading amounts accumulated since the last reset of the odometry.

12.3.1.5 The confidence interval shall comply with the relevant requirements specified in [7].

12.3.1.6 The resolution part of an odometer report shall be given as a parameter in each odometer report from the ETCS Odometer Function. This allows for sensor technologies with varying resolution.

12.3.1.7 Note: The STM can then compute the maximum and minimum travelled distances at the current vehicle position p2 with regards to any reference location p1 by using the resolution information, maximum and minimum distances at the these locations, as follows:

max_distance(p1→p2) = max(D_Res(p1), D_Res(p2)) + D_Max(p2) – D_Max(p1)

min_distance(p1→p2) = - max(D_Res(p1), D_Res(p2)) + D_Min(p2) – D_Min(p1)

12.3.1.8 The distance parameters D_Est, D_Max and D_Min are allowed to wrap when exceeding the value range. The parameters wrap individually.

12.4 Configuration information

12.4.1.1 The ERTMS/ETCS on-board Odometer Function shall transmit performance related information (configuration data) over the FFFIS STM. The transmission shall be repeated to support restarting STMs.

12.4.1.1.1 Note: The STM may use the performance-related information (e.g. ageing) to adjust its supervision, e.g. braking curves.

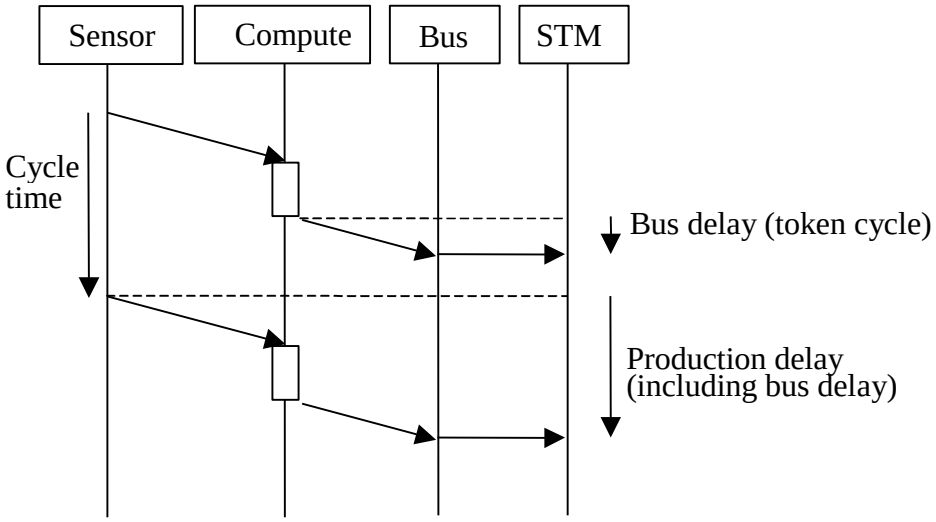


Figure 10 – Odometer cycle and delay times

12.4.1.2 **Typical cycle time, T_OdoCycle** is the typical time for the odometer cycle time between each generating of new odometer data.

12.4.1.3 Note: The actual cycle time may well exceed T_OdoCycle.

12.4.1.4 **Maximum production delay time, T_OdoMaxProd** is the maximum ageing of odometer data from when the data was true until the data is available on the bus. This shall include clock synchronisation inaccuracy of the Odometer Function.

12.4.1.5 Note: The actual production delay time should not exceed T_OdoMaxProd.

13. DRIVER MACHINE INTERFACE FUNCTION

13.1 Introduction

13.1.1.1 The DMI Function allows the driver to directly interact with the ERTMS/ETCS on-board for what regards the national information related to the default window. That means that all inputs from the driver to the ERTMS/ETCS on-board and all outputs from the ERTMS/ETCS on-board to the driver in the default window are controlled by this function.

13.1.1.2 The DMI Function shall provide the unified DMI and the customisable DMI services.

13.1.1.3 An STM designed for usage with a customisable DMI provides a set of configuration data for its default window as part of its product documentation as described in chapter 13.5. The ERTMS/ETCS on-board shall be configurable to store this information and serve the STM DMI requests according to this configuration. The customisable DMI service shall be used, when configuration data for a customisable DMI layout are stored in the ERTMS/ETCS on-board for the NID_STM of the STM.

13.1.1.4 An STM designed to use the unified DMI provides no configuration data as part of its product documentation. The unified DMI service shall be used, when no configuration data for a customisable DMI layout is stored in the ERTMS/ETCS on-board for the NID_STM of the STM.

13.1.1.5 Note: Unconfigurable parts of the DMI functions shall be handled in the same way by the unified and the customisable DMI services.

13.2 General requirements regarding DMI Function

13.2.1.1 The ERTMS/ETCS on-board shall only allow the active STM to communicate with the driver.

13.2.1.2 When the STM is no more active (see 4.1.1.3), the ERTMS/ETCS on-board shall delete all DMI objects controlled by this STM.

13.2.1.3 When the connection between an STM and the DMI Function is disconnected, the ERTMS/ETCS on-board shall delete all the DMI objects controlled by this STM (including preliminary requests) after a timeout of 2 seconds.

13.2.1.3.1 Justification: The timeout of 2 seconds is to give the STM the chance to re-establish the connection.

13.2.1.4 When the connection between the active STM and the DMI Function is lost and re-established within the timeout of 2 seconds, the ERTMS/ETCS on-board shall delete all the DMI objects controlled by the STM when the DMI connection to the STM is established.

13.2.1.5 The ERTMS/ETCS on-board shall be able to receive and store preliminary request for DMI objects from an STM being in HS state and display them immediately after having received the DA state report.

13.2.1.5.1 Note: The sending of preliminary request is to allow the DMI Function to prepare in background the information to be presented to the driver once the STM switches to DA state. Therefore, the STM should send all DMI objects that needs to be displayed after the change to DA as preliminary DMI request.

13.2.1.6 When an STM reports PO, CS or FA, or is considered as failed, the ERTMS/ETCS on-board shall delete all preliminary requests for DMI objects from this STM.

13.2.1.7 If the ETCS train speed is configured not to be displayed for an STM while the ERTMS/ETCS on-board is in SN mode (see chapter 13.5.1.1.7), the ERTMS/ETCS on-board shall inhibit the display of the ETCS train speed only once the DA state report is received from this STM by the STM Control Function.

13.3 DMI channels

13.3.1.1 The DMI Function shall be allowed to use up to four DMI channels. Each channel shall correspond to one connection.

13.3.1.2 At most one DMI channel shall be active, only this one shall be used for the communication related to DMI objects with the DMI Function at application level.

13.3.1.3 Note 1: Connections corresponding to the inactive DMI channels may however remain open.

13.3.1.3.1 Note 2: The ERTMS/ETCS on-board may report a DMI channel as active even if no interaction with the driver is possible, e.g. when no cab is active.

13.3.1.4 At the time the active DMI channel changes, the DMI Function shall delete all the DMI objects controlled by the STM.

13.4 DMI Objects

13.4.1 DMI object identities

13.4.1.1 The DMI objects indicators and buttons used by the different STMs are assigned a unique object identity made of NID_STM and Indicator/Button Identifier.

13.4.1.2 The STM Identity is implicitly provided by the STM by its announced NID_STM (and repeated in each message header according to the language).

13.4.1.3 The Indicator/Button Identifier is provided by the STM as part of the corresponding Indicator/Button request.

13.4.1.4 The Indicator/Button Identifier is used by the STM to be able to change the state of objects and to move or remove them. The Button Identifier is also used by the ERTMS/ETCS on-board to transmit the button events to the STM. If the customisable DMI service is used, it is also used to define the properties of the object.

13.4.1.5 All icons (bitmap symbols) used by the different STMs using a customisable DMI are assigned an icon identity made of NID_STM and Icon Identifier.

13.4.1.6 An Icon Identifier can be provided by the STM as part of the corresponding Indicator/Button request.

13.4.1.7 All sounds (wave form for audible information) used by the different STMs using a customisable DMI are assigned a unique sound identity made of NID_STM and Sound Identifier.

13.4.1.8 A Sound Identifier can be provided by the STM as part of the corresponding sound request.

13.4.1.9 For specifying the position of DMI objects, Position Identifiers are used.

13.4.1.10 If the unified DMI service is used, the Position Identifier specifies an area of the ETCS layout as defined in [9].

13.4.1.11 If the customisable DMI service is used, the Position Identifier and the NID_STM are used to define the position in cell coordinates and size as specified in the configuration data for this STM.

13.4.2 Text messages

13.4.2.1 The DMI Function shall display a text message when requested by the STM. The text message request shall consist of a Text Identifier, a string of text to be shown to the driver, a display attribute and a possible request for driver acknowledgement.

13.4.2.2 The DMI Function shall report to the STM the acknowledgement of text messages (which were required to be acknowledged) from the driver referencing the corresponding Text Identifier.

13.4.2.3 The DMI Function shall delete a text message when requested by the active STM. The request shall reference the Text Identifier of the text message to be deleted.

13.4.2.3.1 Note: The acknowledgement does not lead to the end of the display of a text message.

13.4.2.4 If the STM requests a text message with the same Text Identifier as a not yet deleted text message, the ERTMS/ETCS on-board shall delete the original text message and display the new requested text message.

13.4.2.5 The display attribute specifies the colour of the text, its background colour, the flashing mode and the group of text messages.

13.4.2.6 The flashing mode specifies if the slow, fast or no flashing and if normal or counterphase flashing shall be used.

13.4.3 Indicators

13.4.3.1 An Indicator is a DMI object for display of information without input.

13.4.3.2 The STM shall request the display of an Indicator by means of the following definition:

a) its Indicator Identifier,

b) an optional Icon Identifier,

c) an optional caption text,

d) a Position Identifier,

e) a display attribute.

13.4.3.3 The Icon Identifier shall be used by the DMI Function in case of the customisable DMI service to retrieve from the configuration data the corresponding icon attached to an Indicator/Button object.

13.4.3.4 The display attribute shall specify the background colour and the flashing mode for the whole Indicator and the display colour of the caption text.

13.4.3.5 The flashing mode specifies if the slow, fast or no flashing and if normal or counterphase flashing shall be used.

13.4.4 Buttons

13.4.4.1 Buttons are a pure functional extension of Indicators. All requirements of chapter 13.4.3 shall apply to Buttons, by replacing "Indicator" with "Button".

13.4.4.2 The extension is the transmission of Button events from the DMI Function to STM. The DMI Function shall make a distinction between push event (transition from Button not pressed to pressed state) and release event (opposite transition).

13.4.4.3 The DMI Function shall report Button push and release events to the STM and shall timestamp those event reports to reflect the sequence of events.

13.4.4.4 The DMI Function shall use the Reference Time (see chapter 5.2.2) for timestamping the Button events reports.

13.4.5 Sounds

13.4.5.1 STM shall request a Sound by means of the following definition:

a) an optional Sound Identifier,

b) only in case of a unified DMI and a Sound to be generated, a sequence of segments defined by a duration and an associated frequency,

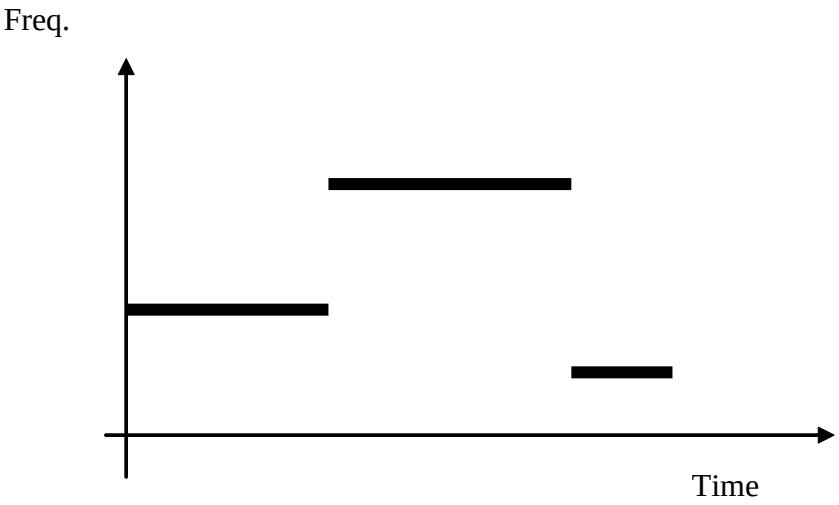


Figure 11 : Example of sound definition

c) an indication if the Sound has to be repeated continuously or not or to be stopped.

13.4.5.2 The Sound Identifier shall be used by the ERTMS/ETCS on-board in case of the customisable DMI service to retrieve from the configuration data the corresponding sound.

13.4.5.3 The Sound Identifier shall be used by the ERTMS/ETCS on-board in both DMI services to stop the generation of a Sound, if requested by the STM.

13.4.5.4 The DMI Function shall be able to manage two STM requests for Sounds at the same time.

13.4.5.4.1 Note: This will allow an STM to request a long Sound and a short Sound simultaneously.

13.4.6 Supervision information

13.4.6.1 There shall be two sets of supervision information:

a) Speed and distance values

b) Colours and display modes

13.4.6.2 Speed and distance values consists of :

a) Permitted Speed

b) Target Speed

c) Target Distance

d) Release Speed

e) Intervention Speed

13.4.6.3 Colours and display modes consists of:

a) Current train speed pointer

- Colour

b) Permitted Speed
   - Colour
   - Display mode: no display, bar only, hook only or hook and bar

c) Target Speed
   - Colour
   - Display mode: no display, bar only, hook only or hook and bar

d) Target Distance
   - Display mode: no display, bar only, digital only or bar and digital

e) Release Speed
   - Colour
   - Display mode: no display, bar only, digital only or bar and digital

f) Intervention Speed
   - Colour
   - Display mode: no display, display with normal bar width or display with wide bar width.

13.4.6.4 The DMI Function shall use the last received information for Current train speed pointer, Target Speed, Release Speed, Permitted Speed, Intervention Speed and Target Distance.

13.5 Customisable DMI service

13.5.1.1 The configuration of the customisable DMI shall define the following data for each STM using the customisable DMI service:

13.5.1.1.1 The NID_STM of the STM.

13.5.1.1.2 The list of Indicators defined for the STM with the following data for each Indicator:

a) identifier (a number);

b) font size (height in cells);

c) horizontal text-alignment (left, right or centred);

d) vertical text-alignment (upper part, lower part or centred).

13.5.1.1.3 Two lists of Indicator positions (one list for soft key technology and one list for touch screen technology) defined for the STM, and for each Indicator position:

a) identifier (a number);

b) x:y offset of the upper left corner in cells;

c) x:y size of the area in cells.

13.5.1.1.4 The list of Buttons defined for the STM with the following data for each Button:

a) identifier (a number);

b) font size (height in cells);

c) horizontal text-alignment (left, right or centred);

d) vertical text-alignment (upper part, lower part or centred).

13.5.1.1.5 Two lists of Button positions (one list for soft key technology and one list for touch screen technology) defined for the STM and, for each Button position:

a) identifier (a number);

b) x:y offset of the upper left corner in cells;

c) x:y size of the area in cells;

d) linked soft key (for soft key technology).

13.5.1.1.6 The list of Icons defined for the STM and, for each Icon:

a) identifier (a number);

b) bitmap, as RGB bitmap file (according to Microsoft BMP file format); Pixels in the bitmap files shall be understood as cells.

c) display of text upon icon: yes/no.

13.5.1.1.7 ETCS speed and distance supervision

a) For speed and distance supervision display in speed dial as for ETCS in area B0-B2, B6 and A2-A3 (applicable as long as the STM is active):

b) Yes/No; “Yes” means that the ETCS train speed display is re-used as such together with the supervision information as specified in 13.4.6. “No” means that there is no display of speed and distance supervision in the ETCS way.

c) if Yes: speed dial range (0-140/180/250/400 km/h or same range as ETCS).

13.5.1.1.8 Options for flashing of Indicators and Buttons (additionally to flashing mode):

a) the frequency for slow and fast flashing;

b) the flashing style either as ‘yellow frame’ or as ‘whole area’.

13.5.1.1.9 The list of Sounds defined for the STM and, for each sound, its Sound definition.

a) identifier (a number);

b) sound, as WAV file (according to Microsoft WAV file format);

13.5.1.1.10 Moved areas of the ETCS layout:

a) If a STM needs partially or totally the cells used by an area defined in the ETCS layout and in which ETCS DMI objects are displayed in level NTC modes SN or NL, the ETCS objects displayed in it must be moved somewhere else on the national layout. Therefore it shall be possible to specify a changed location for moving the following ETCS areas and their related ETCS objects. For buttons also the new related soft key (F1-F5) must be defined:

- Areas F1-F5 for the buttons for selecting the main, override, data view, special or settings window;
- Area A4 for the adhesion “slippery rail”;
- Areas B7 and C8 for the ETCS mode and level display;
- Area C1 for the mode/level acknowledgements;
- Area C7 for the Override status indication;
- Area C9 for the brake indication;
- Area E1 for safe radio connection indication;
- Area G13 for local time

b) The new location shall be specified by a new x:y position in cells.

c) The moved areas shall have the same size as the original ETCS areas.

13.5.1.2 Recapping Table with configuration data for customisable DMI:

Description	**Multiplicity**	**Range and unit**
NID_STM of the STM	1	0-254
Number of Indicators	1	0-255
Indicator id (i)	For each Indicator	1-255
Font size (i)	For each Indicator	height in cells (8-60)
Horizontal text alignment (i)	For each Indicator	Left , right, centred
Vertical text alignment (i)	For each Indicator	upper part, lower part, centred
Number of Indicator positions in case of touch screen technology	1	0-24
Indicator position id (i)	For each Indicator position	1-24
X Offset of the upper left corner (i)	For each Indicator position	0-639 [cells]
Y Offset of the upper left corner (i)	For each Indicator position	0-479 [cells]
Horizontal size (i)	For each Indicator position	8-640 [cells]
Vertical size (i)	For each Indicator position	8-480 [cells]
Number of Indicator positions in case of soft key technology	1	0-24
Indicator position id (i)	For each Indicator position	1-24
X Offset of the upper left corner (i)	For each Indicator position	0-639 [cells]
Y Offset of the upper left corner (i)	For each Indicator position	0-479 [cells]
Horizontal size (i)	For each Indicator position	8-640 [cells]
Vertical size (i)	For each Indicator position	8-480 [cells]
Number of Buttons	1	0-255
Button id (i)	For each Button	1-255

Font size (i)	For each Button	height in cells (8-60)
Horizontal text alignment (i)	For each Button	Left , right, centred
Vertical text alignment (i)	For each Button	upper part, lower part, centred
Number of Button positions in case of touch screen technology	1	0-24
Button position id for touch screen (i)	For each Button position	1-24
X Offset of the upper left corner (i)	For each Button position	0-639 [cells]
Y Offset of the upper left corner (i)	For each Button position	0-479 [cells]
Horizontal size (i)	For each Button position	8-640 [cells]
Vertical size (i)	For each Button position	8-480 [cells]
Number of Button positions in case of soft key technology	1	0-24
Button position id for soft key (i)	For each Button position	1-24
X Offset of the upper left corner (i)	For each Button position	0-639 [cells]
Y Offset of the upper left corner (i)	For each Button position	0-479 [cells]
Horizontal size (i)	For each Button position	8-640 [cells]
Vertical size (i)	For each Button position	8-480 [cells]
Linked soft key	For each Button position	F1-F10,H2-H4
Number of Icons	1	0-255
Icon id (i)	For each Icon	1-255
Icon (i)	For each Icon	Bitmap file
Display text upon icon	For each Icon	Yes/No
ETCS speed and distance supervision	1	Yes/No
ETCS speed dial range	1	No, same as ETCS, 140, 180, 250, 400 km/h
Slow flashing frequency for Buttons and Indicators	1	(0,5 – 8) Hz
Fast flashing frequency for Buttons and Indicators	1	(0,5 – 8) Hz
Flashing style	1	Frame, whole area
Number of Sounds	1	0-255
Sound id (i)	For each Sound	1-255
sound (i)	For each Sound	Wave file
Number of moved areas of the ETCS layout	1	0 – 13
ETCS area of moved element(i)	For each moved element	A4, B7, C1, C7-C9, E1, F1-F5, G13

X Offset of the upper left corner (i) of new location	For each moved element	0-639 [cells]
Y Offset of the upper left corner (i) of new location	For each moved element	0-479 [cells]
Soft key Identifier (i)	For each moved button	F1-F10, H2-H4

14. JURIDICAL DATA FUNCTION

14.1.1.1 The ERTMS/ETCS on-board equipment shall be able to receive and forward national juridical data to the On-Board Recording Device.

14.1.1.2 The STM shall use the Reference Time (see chapter 5.2.2) for time stamping the juridical data sent to the ERTMS/ETCS on-board.

14.1.1.3 The time stamp of the juridical data shall represent the time the sent event occurred.

14.1.1.3.1 Note: This is in order to respect the event chronology.

15. LIMITATIONS

15.1 Limitations related to DMI

15.1.1.1 The maximum number of characters (coded in UTF-8 by 1 or 2 bytes) to display shall be

a) 40 characters for text messages in text message request.

b) 12 characters for button and indicator caption text in button and indicator requests

15.1.1.2 The allowed text font height range for the configurable elements of the DMI layout of an STM using the customisable DMI service shall be from 8 to 60 cells.

15.1.1.3 The allowed range for the frequencies for slow and fast flashing for an STM using the customisable DMI service is 0,5 – 8 Hz.

15.1.1.4 The ERTMS/ETCS on-board DMI Function shall be able to store at least 10 STM text messages.

15.2 Limitations related to Specific NTC Data Entry/Data View

15.2.1.1 The number of Data Identifiers within one “Specific NTC Data Entry request” shall be limited to 15 Data Identifiers.

15.2.1.2 The number of Data Identifiers within one “Specific NTC Data values” shall be limited to 15 Data Identifiers.

15.2.1.3 The number of Data Identifiers within one “Specific NTC Data View values” shall be limited to 15 Data Identifiers.

15.2.1.4 The maximum number of characters (coded in UTF-8 by 1 or 2 bytes) shall be:

a) 20 characters for data labels in “Specific NTC Data Entry request” and “Specific NTC Data View values”

b) 10 characters for data values in “Specific NTC Data Entry request” and “Specific NTC Data values”

c) 10 characters for data view values in “Specific NTC Data View values”

16. VERSION MANAGEMENT

16.1 Introduction

16.1.1.1 The version of the FFFIS STM defines unambiguously the mandatory interface functions that ensure technical exchangeability between ERTMS/ETCS on-board and STM.

16.1.1.2 During the life time of the FFFIS STM there may be several versions of the FFFIS STM.

16.1.1.3 The objective of this section is to define requirements applicable to ERTMS/ETCS on-board equipment and to STM, when different versions of the FFFIS STM have been defined.

16.2 Identification/evolution of the versions

16.2.1.1 The evolution of the versions of the FFFIS STM shall be sequential, i. e. there shall only be a direct upgrade of an existing version and no branch is accepted.

16.2.1.2 The version of the FFFIS STM shall be identified by a number which complies with the following:

a) Each Version Number will have the following format: X.Y, where X and Y are any number between 0 and 255 (examples: 2.0, 3.0, 4.2).

b) The first number (X) distinguishes not compatible versions.

c) The second number (Y) indicates compatibility within a version X.

d) If the first number of two versions is the same, that indicates that those versions are compatible, independently of the second number (e. g. version 4.5 is compatible with 4.3, 4.14).

16.2.1.3 The “FFFIS STM version number X or Y” is incremented only when the functionality of the FFFIS STM changes.

16.3 Version numbers

16.3.1.1 Table of FFFIS STM version numbers

	FFFIS STM Version Number	Supported by ERTMS/ETCS on-board equipment	Remark
	X=2, Y=0, Z=0	Supplier specific	Initial Version, introduced in SUBSET-035 v2.0.0.
	X=3, Y=0, Z	Supplier specific	Introduced in SUBSET-035 v2.1.1 (General revision of the FFFIS STM) Z is vendor specific
Legal backward compatibility envelope	X=4, Y=0	Yes	Introduced in SUBSET-035 v3.x.0 (General revision of the FFFIS STM in the frame of ETCS baseline 3)

16.3.1.2 The STM shall support and send one and only one “FFFIS STM version number”, which is the highest one amongst those included in the “legal backward compatibility envelope”, as defined in table 16.3.1.1.

16.3.1.3 The ERTMS/ETCS on-board equipment shall support any of the “FFFIS STM version numbers X” included in the “legal backward compatibility envelope”, as defined in table 16.3.1.1.

16.3.1.4 All nodes/functions of the ERTMS/ETCS on-board equipment shall support the same “FFFIS STM version numbers” and shall therefore send the same “FFFIS STM version number”, when opening a connection with a given STM (see section 7.1.2).

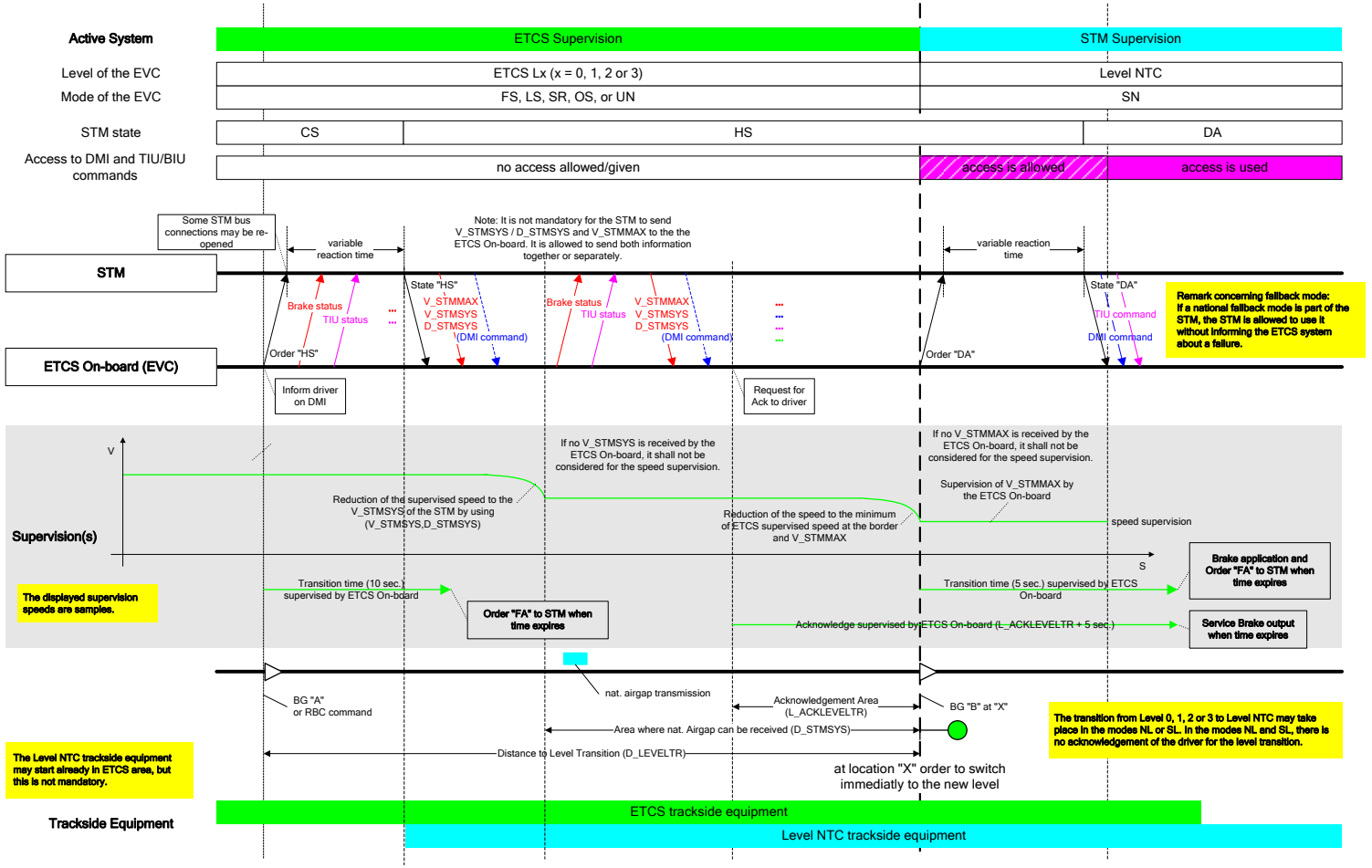
16.3.1.5 When a connection is successfully established with a “FFFIS STM version number X” lower than the highest STM version numbers X included in the “legal backward compatibility envelope”, the ERTMS/ETCS on-board equipment shall apply the corresponding set of requirements as per section 16.4, in order to ensure backward compatibility between the ERTMS/ETCS on-board equipment and the STM.

16.4 Management of older FFFIS STM versions by ERTMS/ETCS on-board

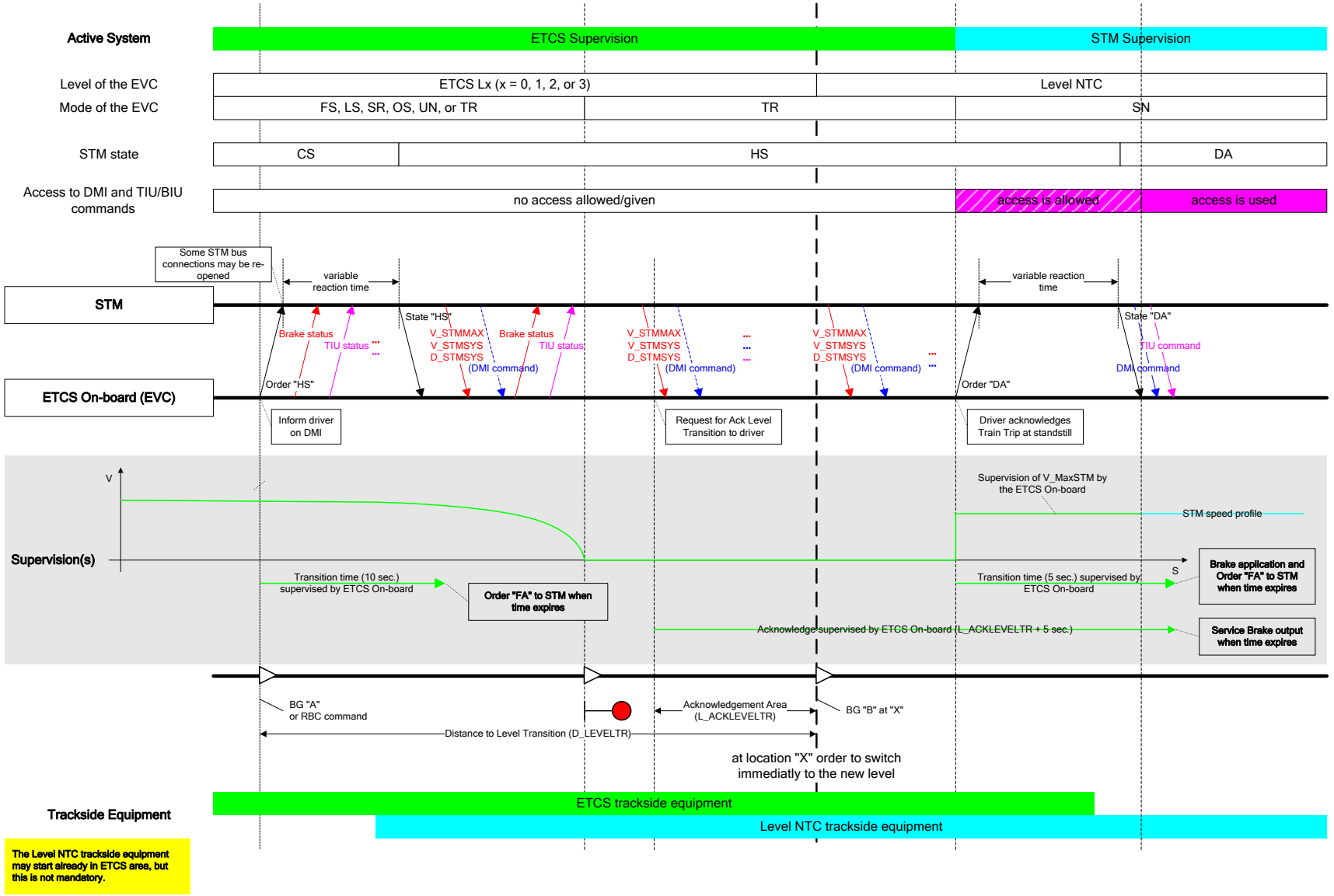
16.4.1.1 The “FFFIS STM version number” introduced in this version of the SUBSET-035 is the starting point of the “legal backward compatibility envelope”, which means that whether an ERTMS/ETCS on-board equipment supports a “FFFIS STM version number X” lower than the one introduced in this version of the SUBSET-035 is supplier specific and outside the scope of this document.

17. ANNEX A: SYSTEM DIAGRAMS LINKED TO THE LEVEL TRANSITIONS WITH STMS (INFORMATIVE)

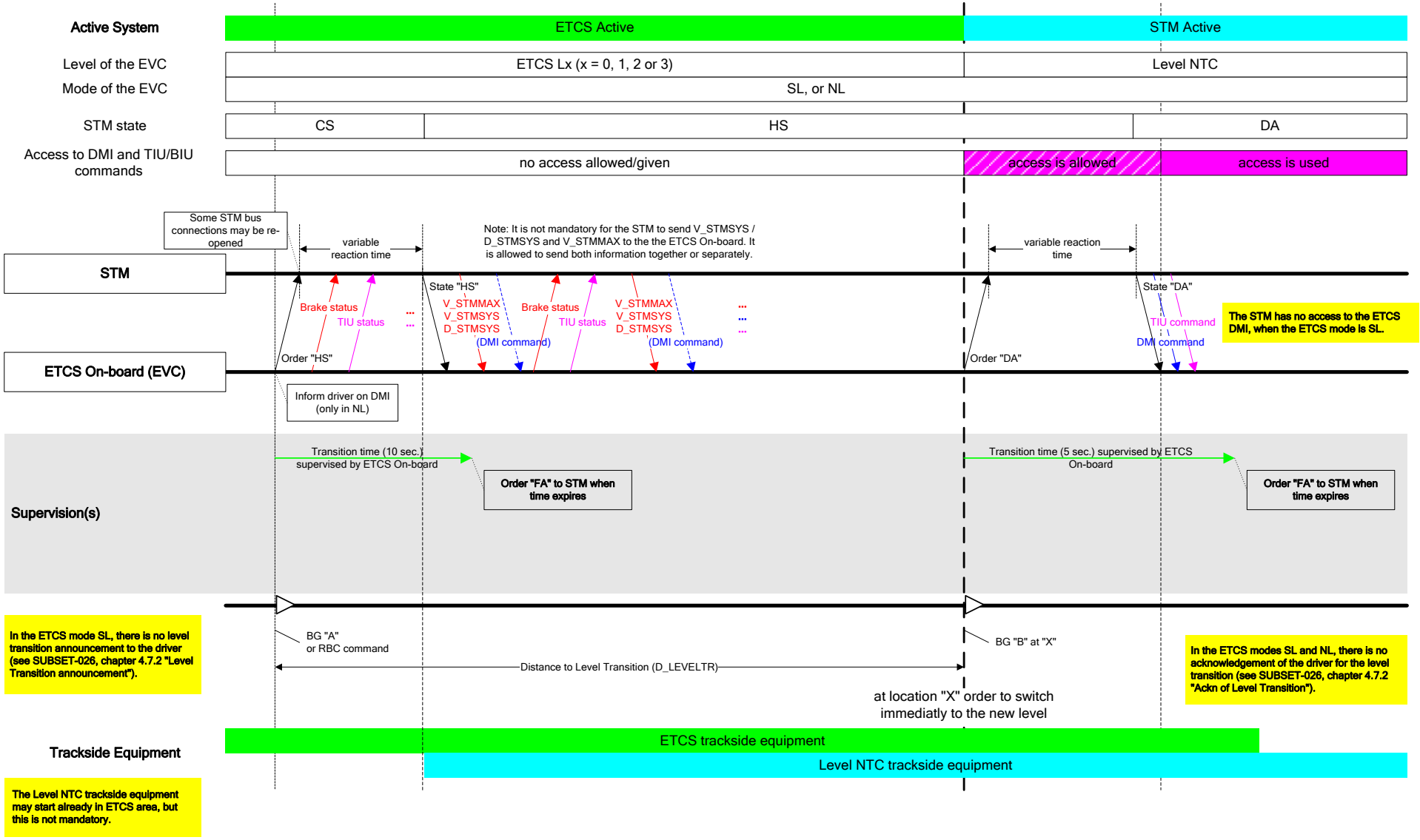
17.1 ETCS → NTC



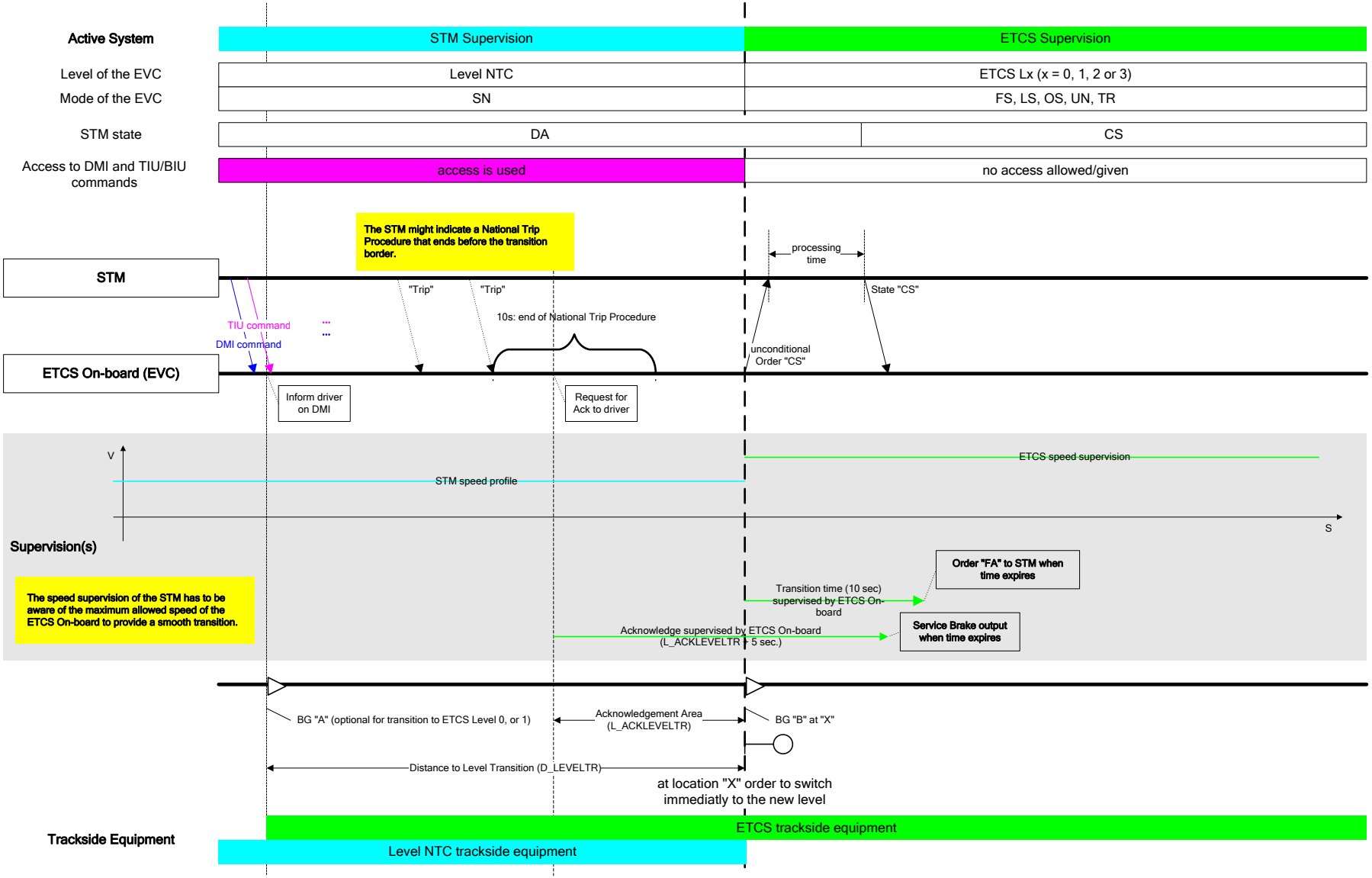
17.2 ETCS → NTC (Trip Mode)



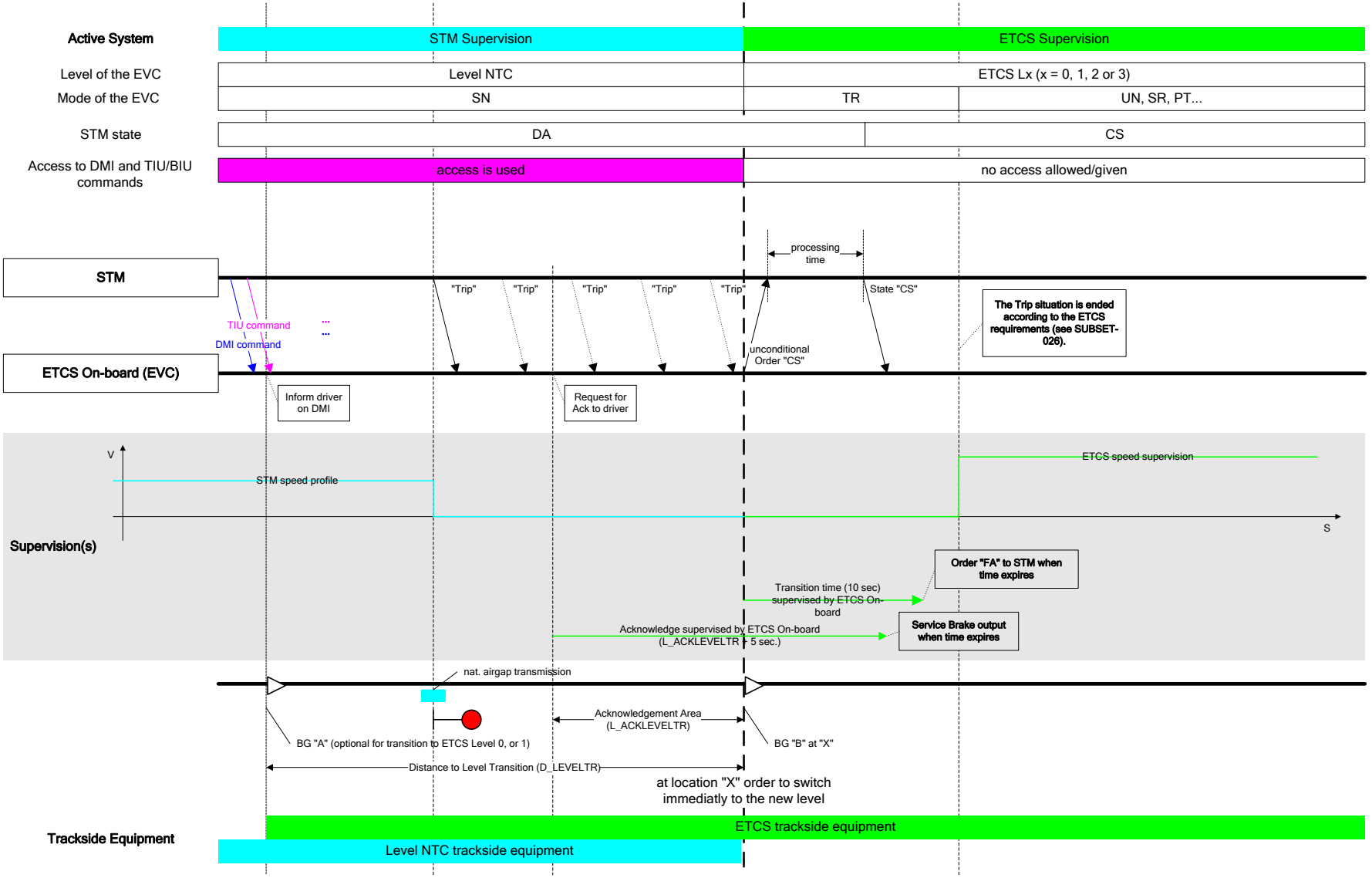
17.3 ETCS → NTC (NL/SL)



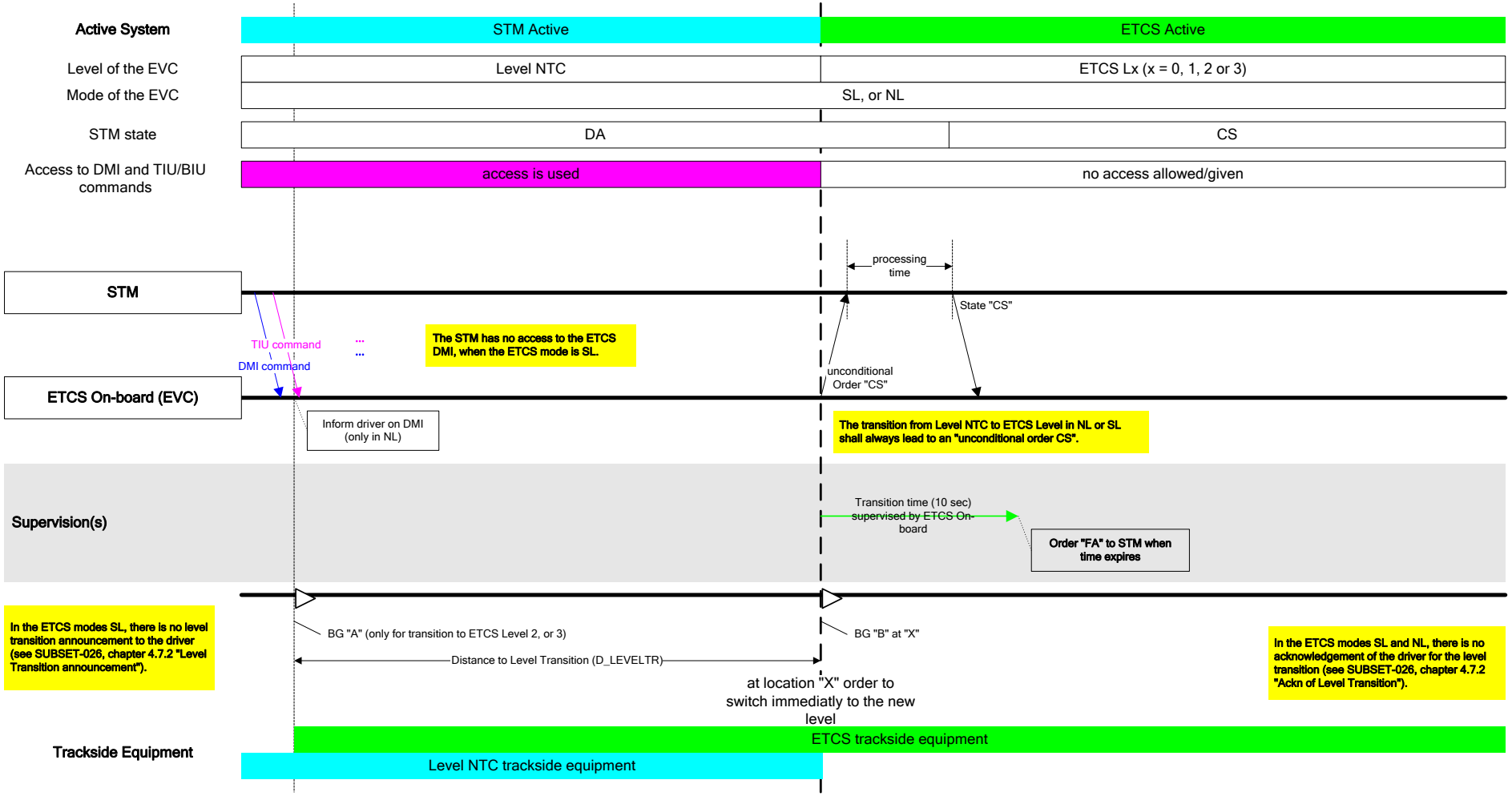
17.4 NTC → ETCS



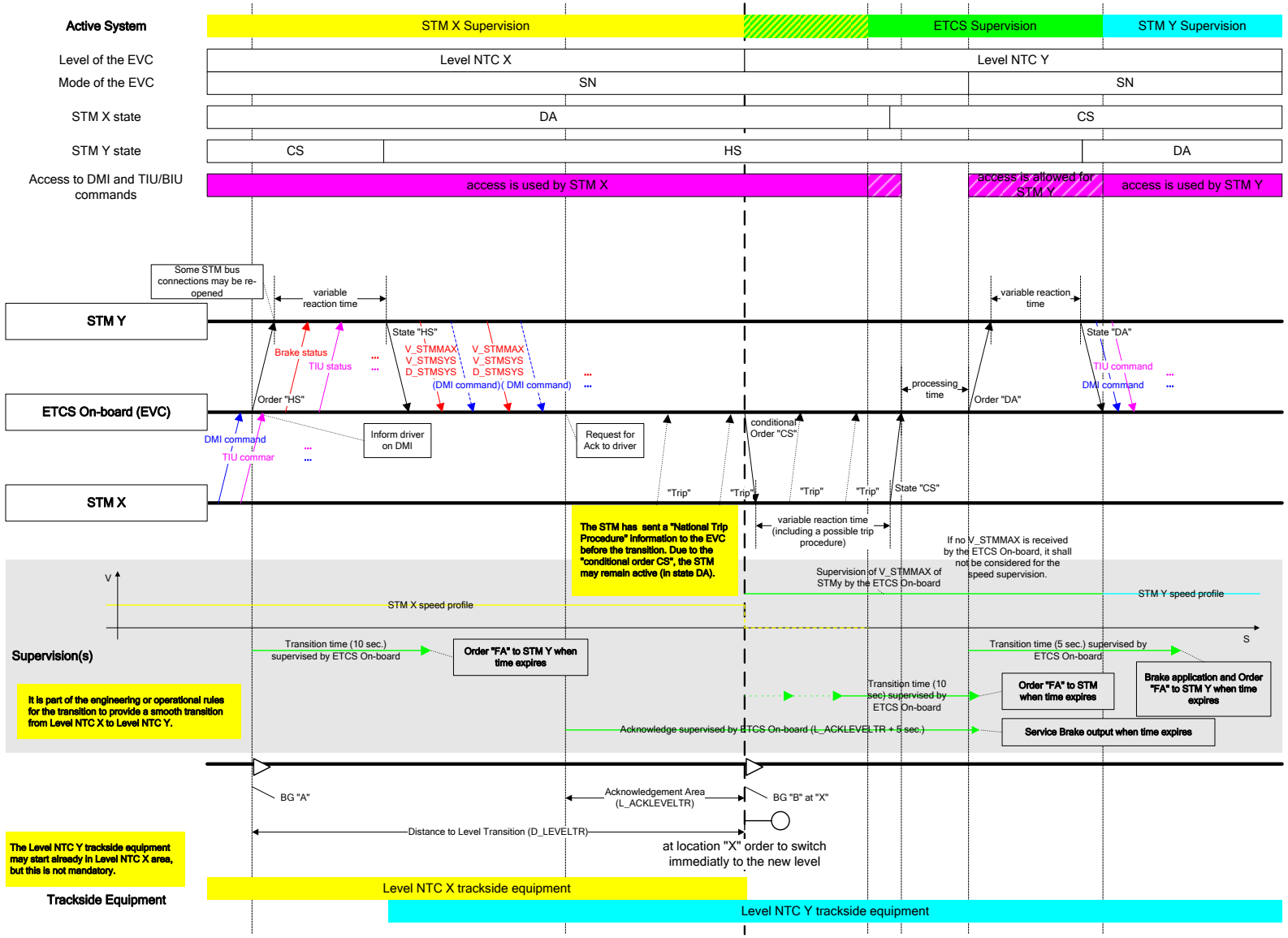
17.5 NTC → ETCS (National Trip Procedure)



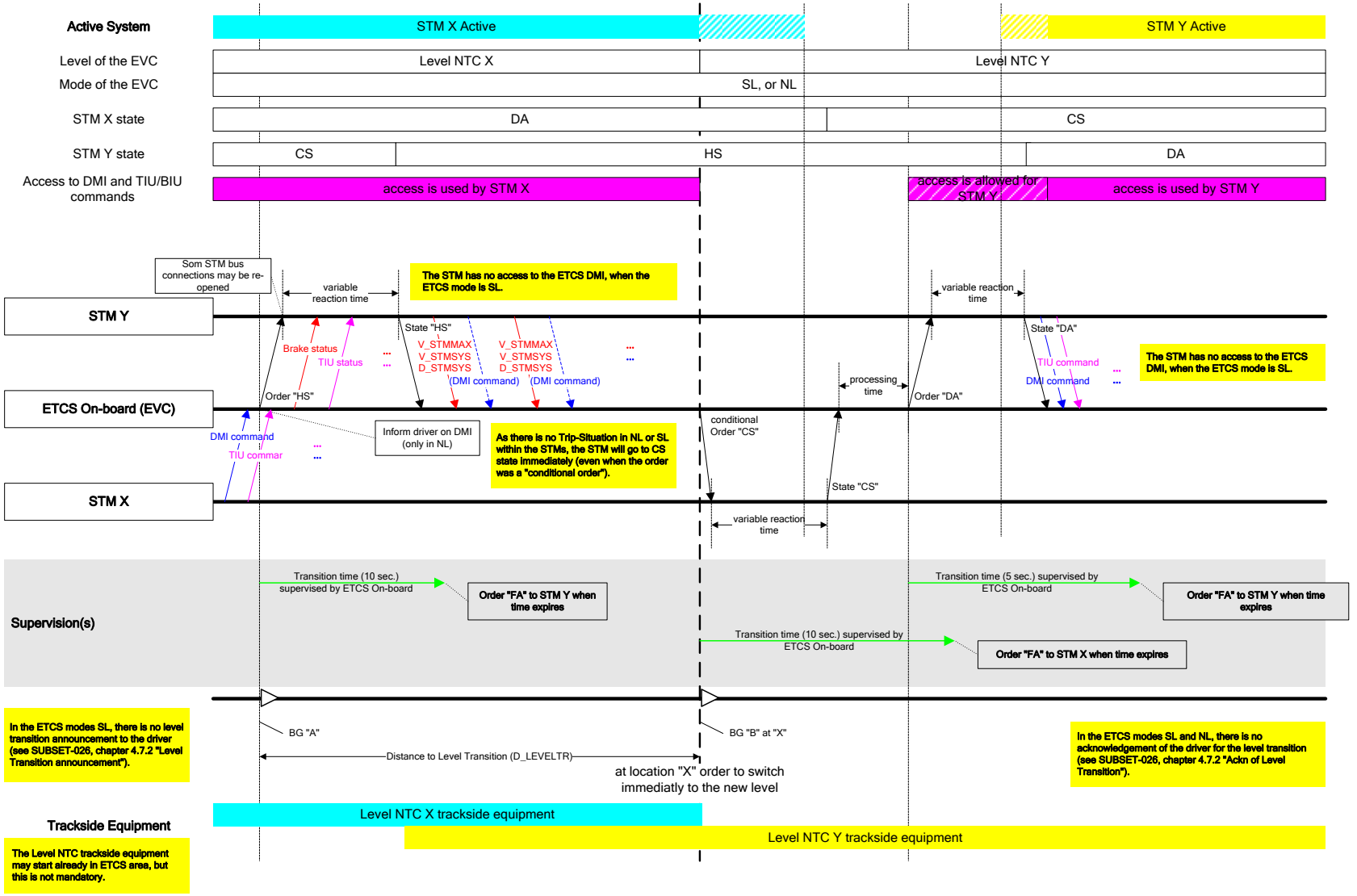
17.6 NTC → ETCS (NL/SL)



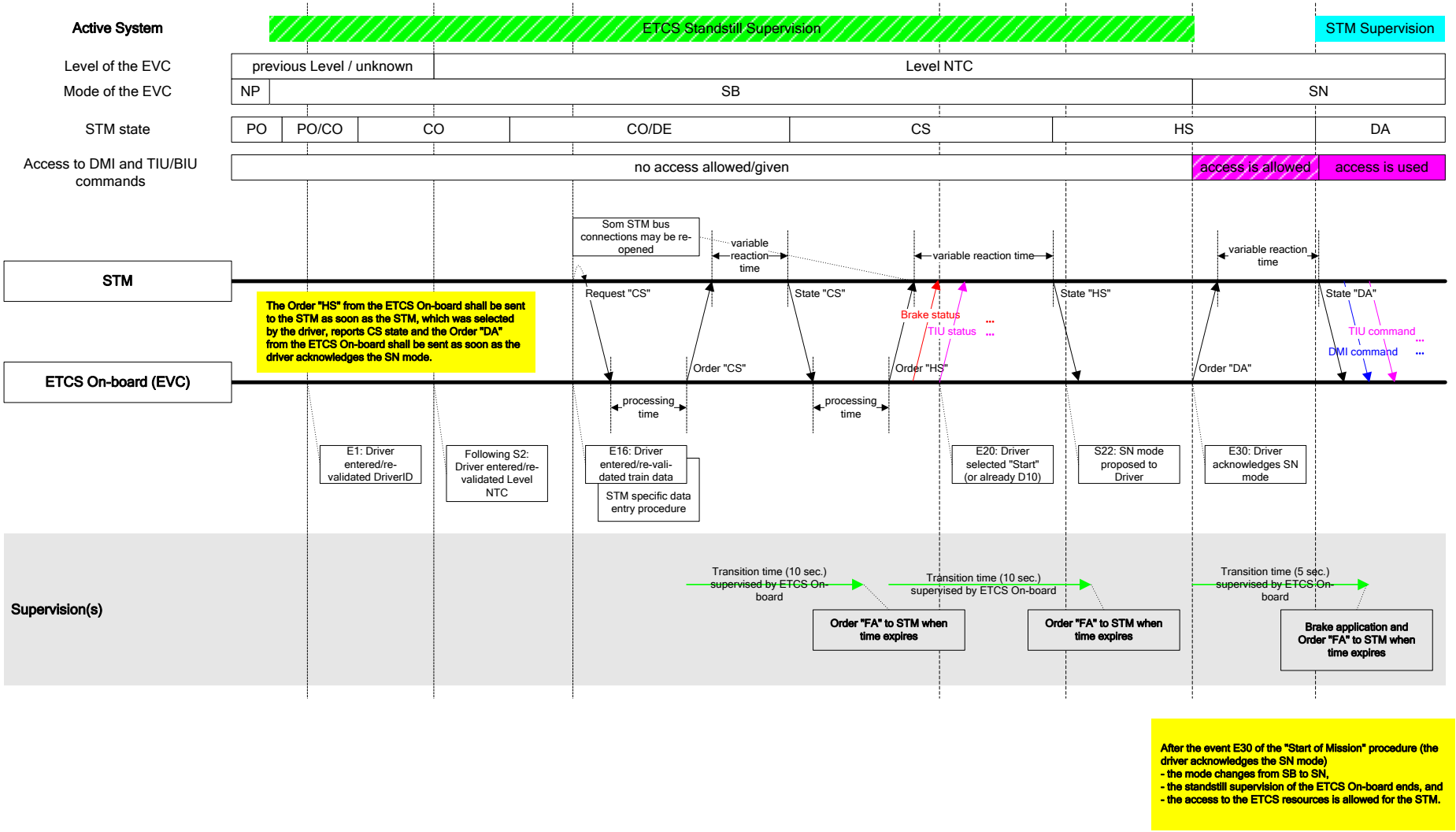
17.7 NTC X → NTC Y



17.8 NTC X → NTC Y (NL/SL)

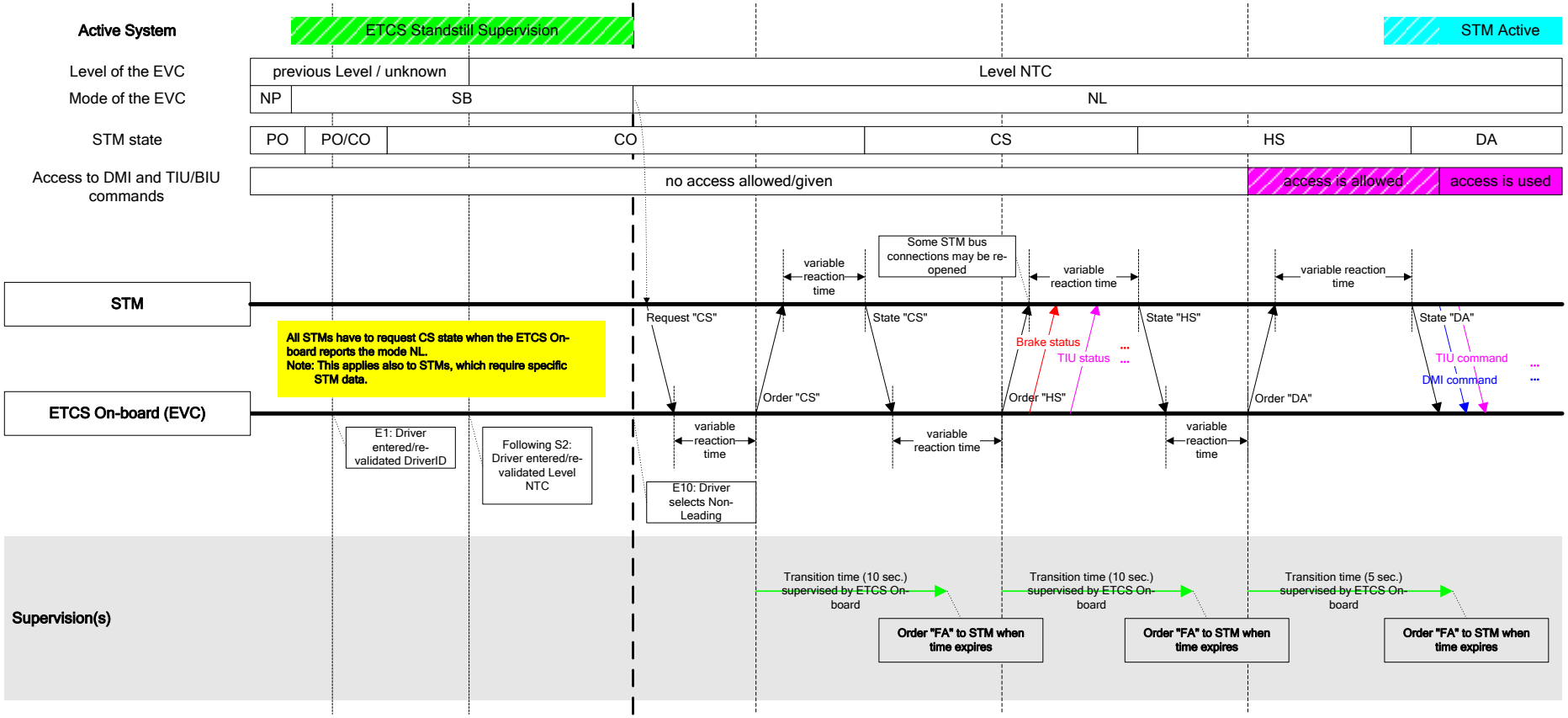


17.9 Power On in Level NTC (SoM)

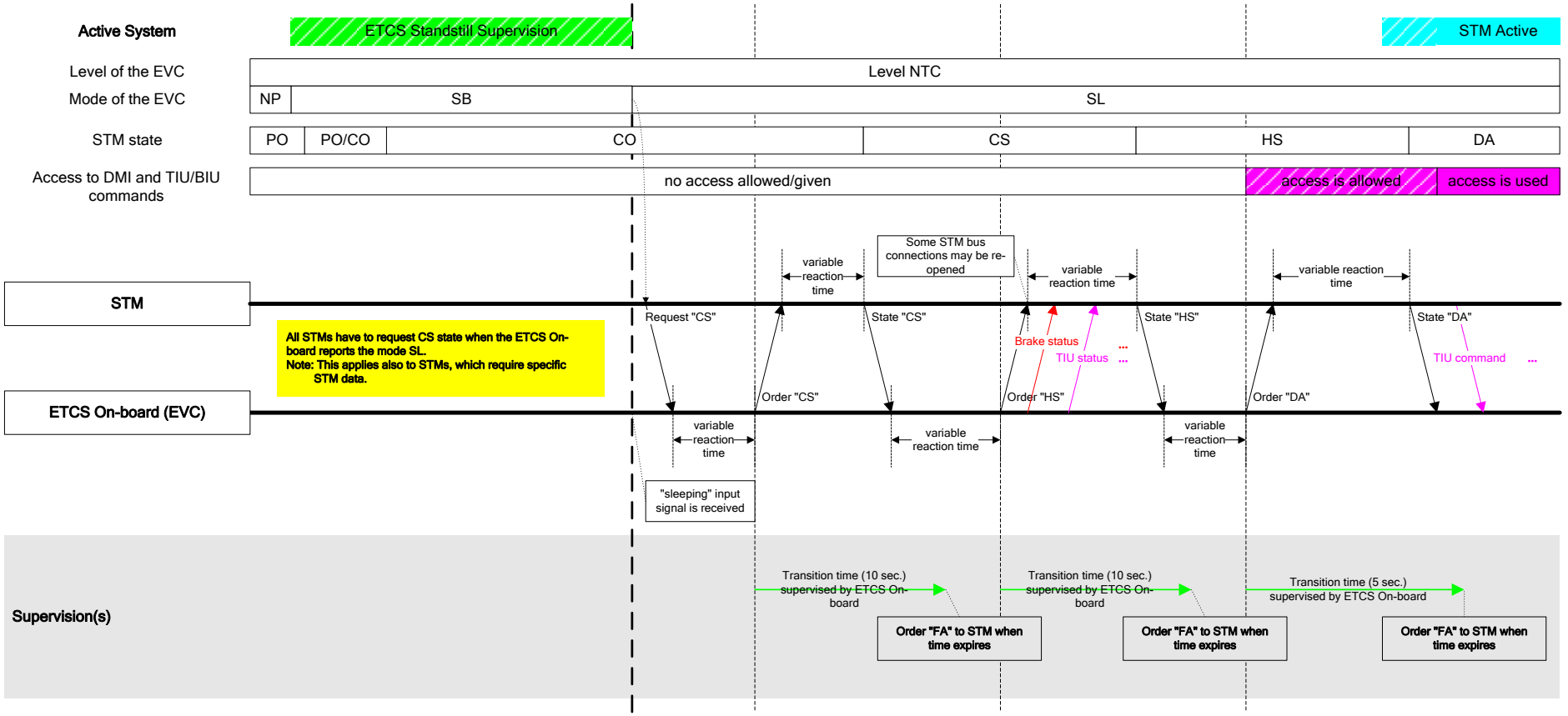


After the event E30 of the "Start of Mission" procedure (the driver acknowledges the SN mode)
- the mode changes from SB to SN,
- the standstill supervision of the ETCS On-board ends, and
- the access to the ETCS resources is allowed for the STM.

17.10 Power On in Level NTC (NL)



17.11 Power On in Level NTC (SL)



18. ANNEX B : TRAIN DATA ENTRY PROCEDURE (INFORMATIVE)

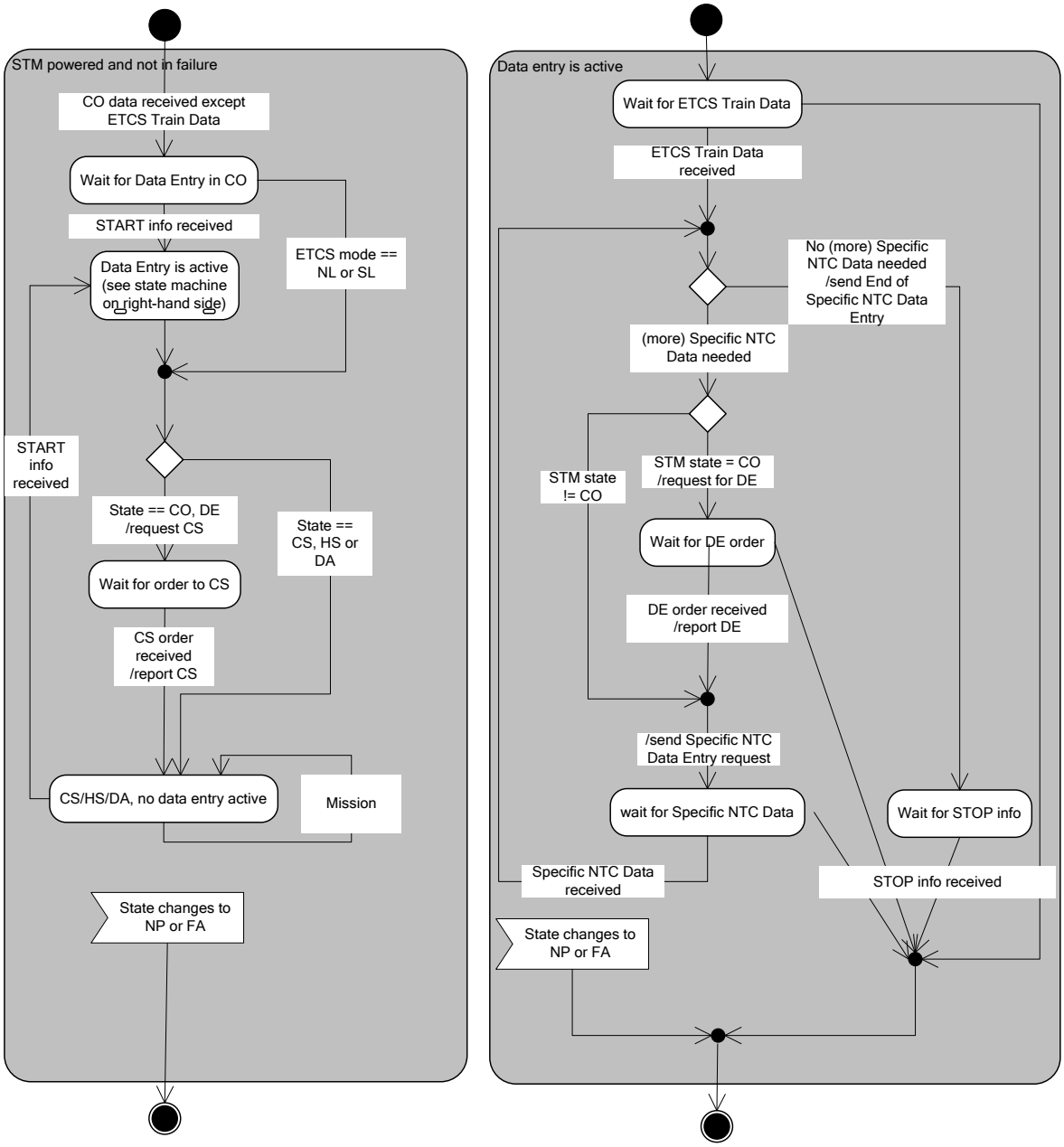


Figure 12 – Train Data Entry procedure