



ERTMS/ETCS

FFFIS STM Test Cases of Functional identity 006

DATA AVAILABLE FUNCTIONALITY

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| Company | Technical Approval | Management approval |
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Modification History

| Issue Number Date | Section Number | Modification / Description | Author |
|----------------------|-----------------|--|---------------------------------|
| 0.0.1 01/07/2004 | All | First version/review issued after WG meeting on the 16/06/2004 based on individual test case. | Ansaldo FB |
| 0.0.2 01/09/2004 | All | All test cases completed. | Ansaldo FB |
| 0.0.3 06/09/2004 | ALL | Update during UNISIG STM WG meeting in Madrid | Ansaldo FB |
| 0.0.4 24/09/2004 | ALL | Complete the review started during the STM WG meeting in Madrid | Ansaldo FB |
| 0.0.5 22/10/2004 | ALL | Add the packet STM_161 in test case 6.1.2.3.0.0.0 Add the packets STM_35 and STM_46 in test case 6.3.0.0.0.0.0 Update in Brussels meeting. | Ansaldo FB |
| 0.0.11 30/11/2004 | ALL | Update following Brussels meeting | Ansaldo FB |
| 0.0.12 26/01/2005 | ALL | Take into account traceability issue : (5.2.10.1.0 DMI); ;10.7.3.5.0 STM Indicator, button & sound + add test case for 10.7.3.5.0 STM Track data&track condition, override + slippery. | Ansaldo FB |
| 0.1.0 27/01/2005 | | Editorial changes for delivery | F. Bernaudin (Ansaldo) |
| 0.1.1 13/10/2005 | 6.5, 6.7 & 6.10 | Take into account input and output to BIU and TIU. | F. Bernaudin (Ansaldo) |
| 1.0.0 13/10/2005 | | Update version number for official release. | F. Bernaudin (Ansaldo) |
| 1.0.1 11/04/2007 | | Updated due to comments received | R. Ramos |
| 1.0.2 04/10/07 | | Updated due to the update of the specifications | R. Ramos |
| 2.9.1 30/01/2013 | All | Updated to be in line with Subset 35 issue 3.0.0 date 2010-02-29, SRS issue 3.3.0 date 2012-03-07 and ETCS DMI specification issue 3.3.0 date 2012-03-01 | Invensys Rail Manuel Lorenzo |

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| | | | |
|---------------------|--|---|---------------------------|
| 2.9.2 30/08/2013 | All | Updated according to 2 nd review process, see revision marks | Manuel Lorenzo |
| 2.9.3 31/10/2013 | Diagram 6g Test Case 6h.1 Test Case 6g.1 | Updated according to CR 1158 (considering impact from CR 1148 and CR 1173 and STMWG comments) | Manuel Lorenzo |
| 2.9.4 28/02/2014 | Test Case 6h.1 | Added "Step 3" (Train Running Number is changed) | Manuel Lorenzo |
| 2.9.5 2014-04-24 | Front page | Baseline 3 1 st Maintenance pre-release version | Thomas Mandry (Alstom) |
| 3.0.0 2014-05-09 | - | Baseline 3 1 st Maintenance release version | Philippe Prieels |

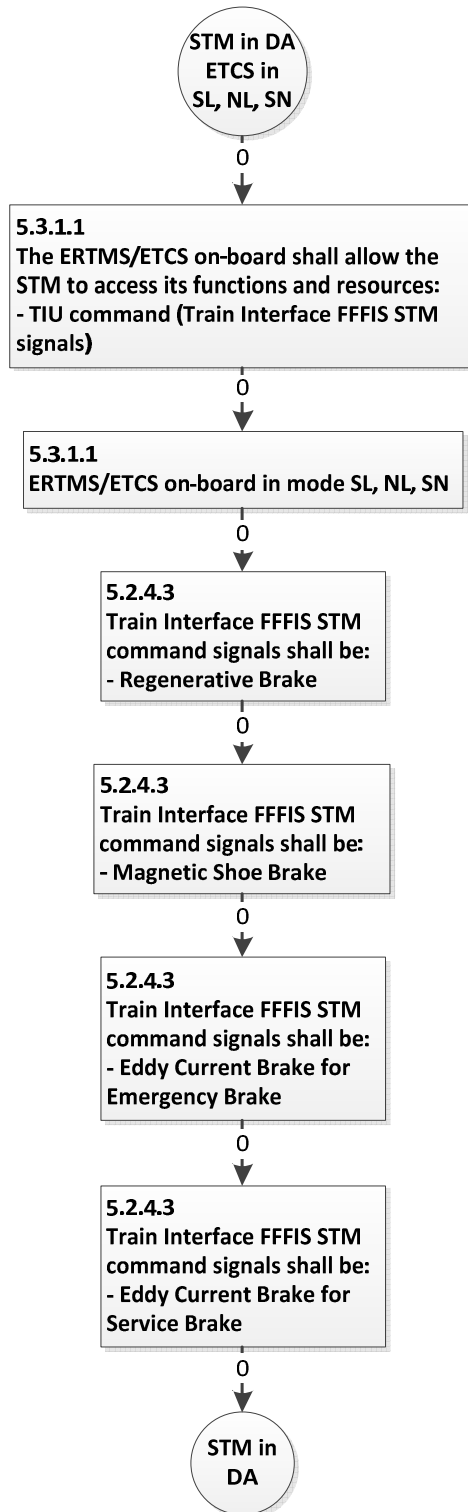


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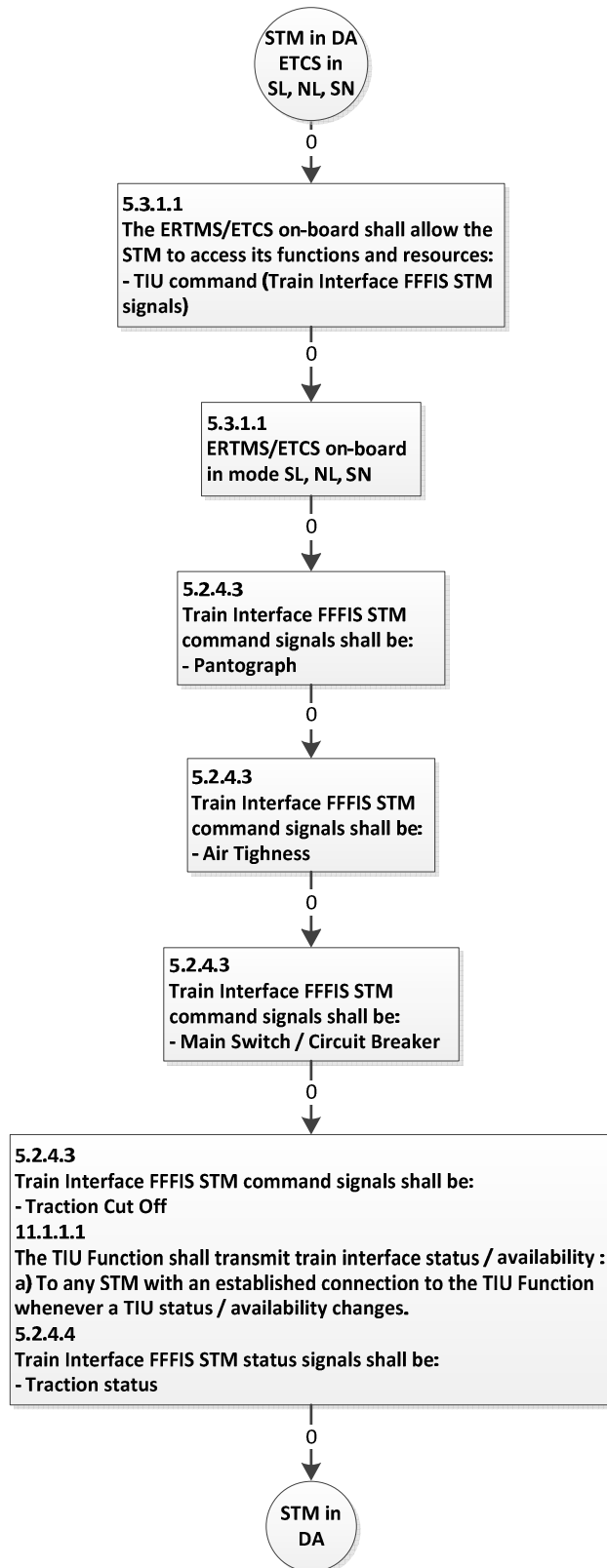
Diagrams

6a



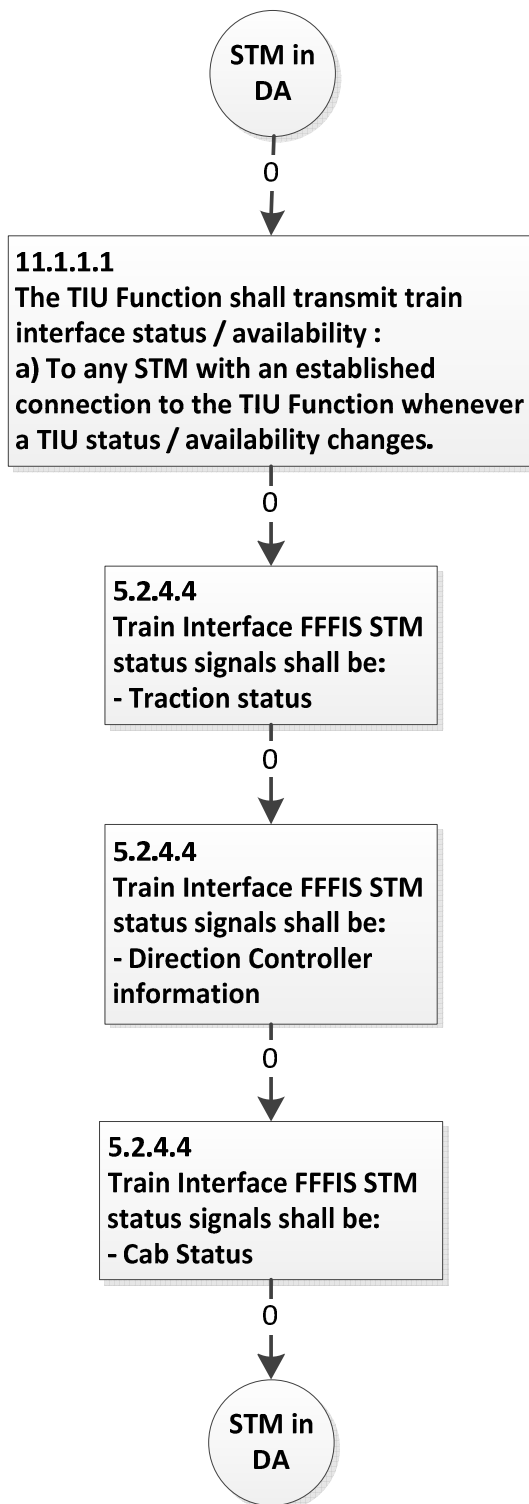
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6b

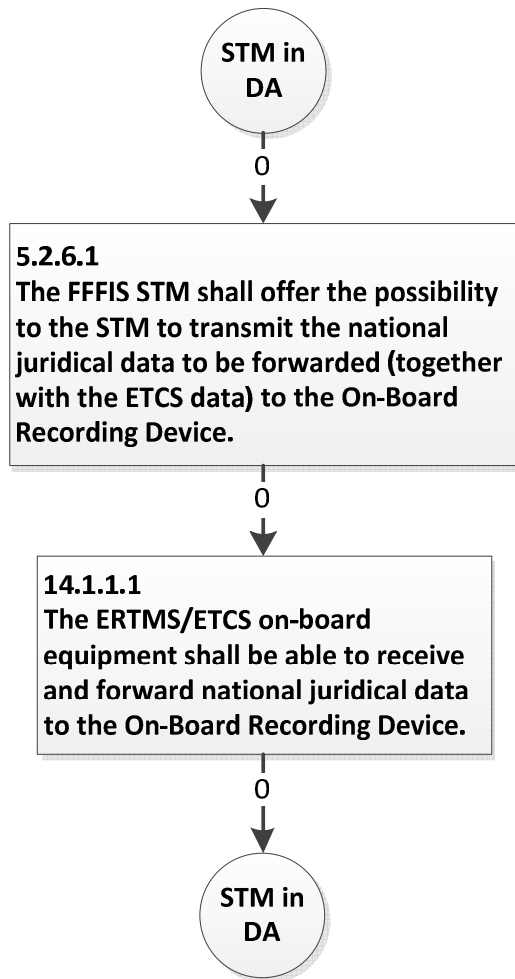


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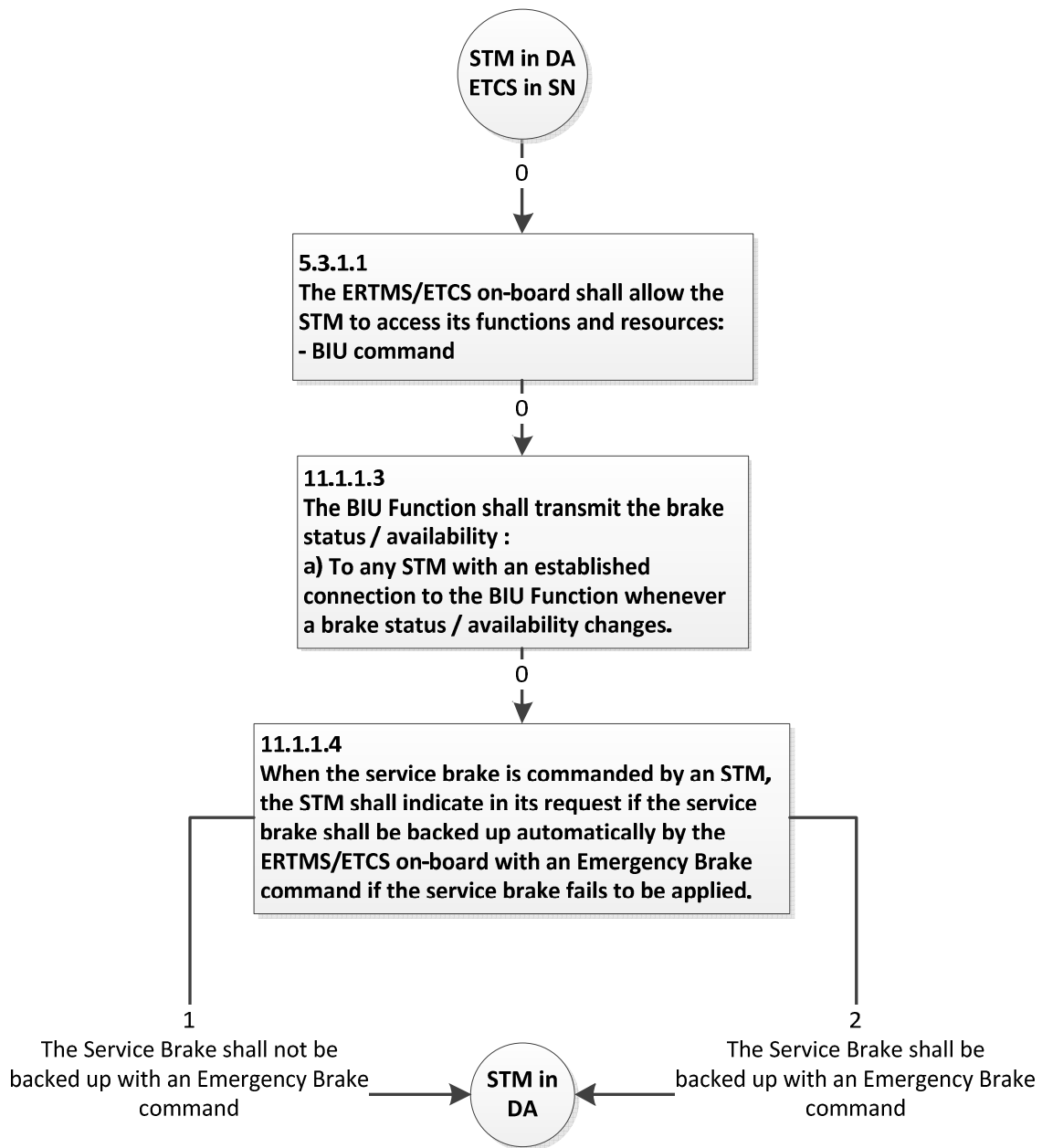
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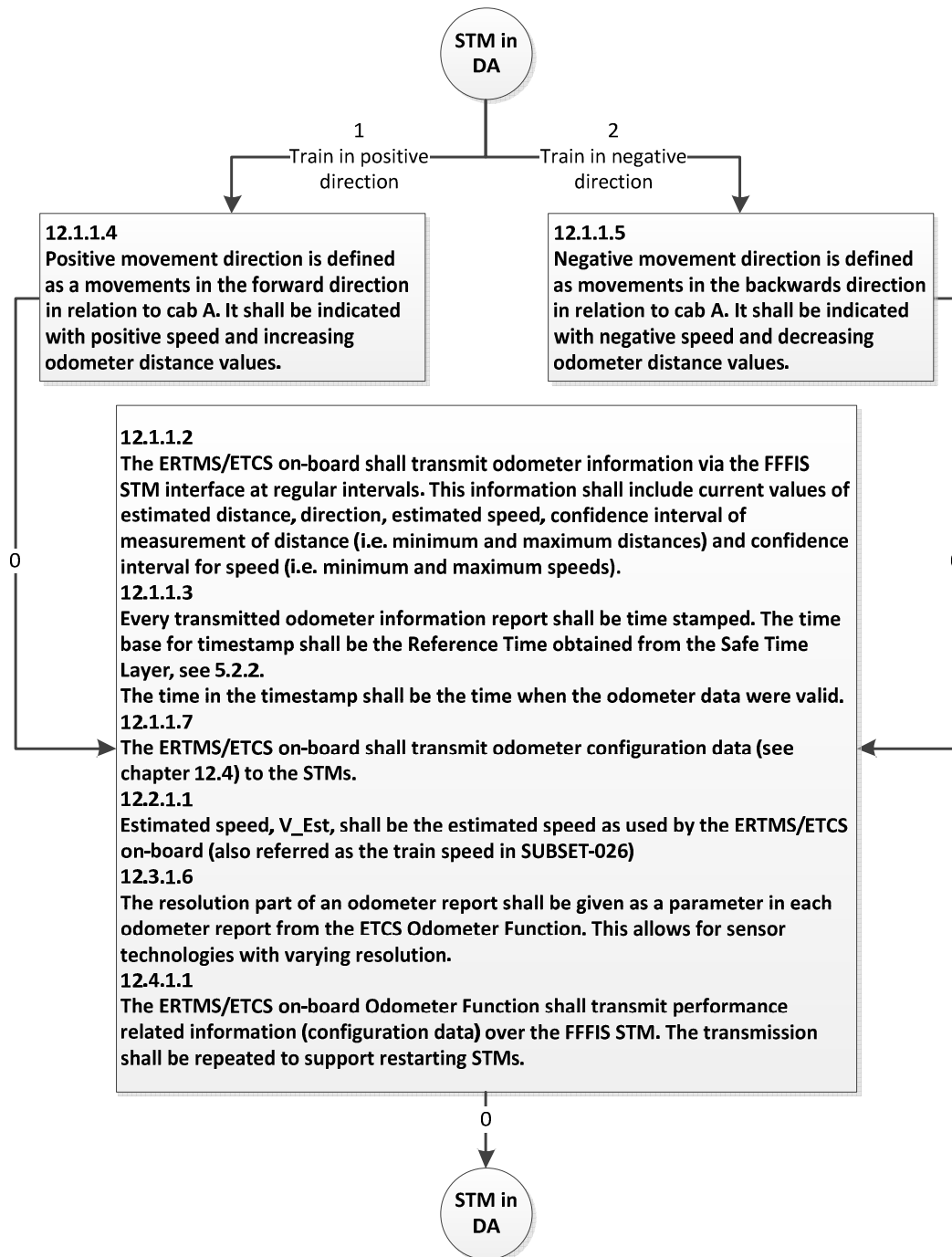
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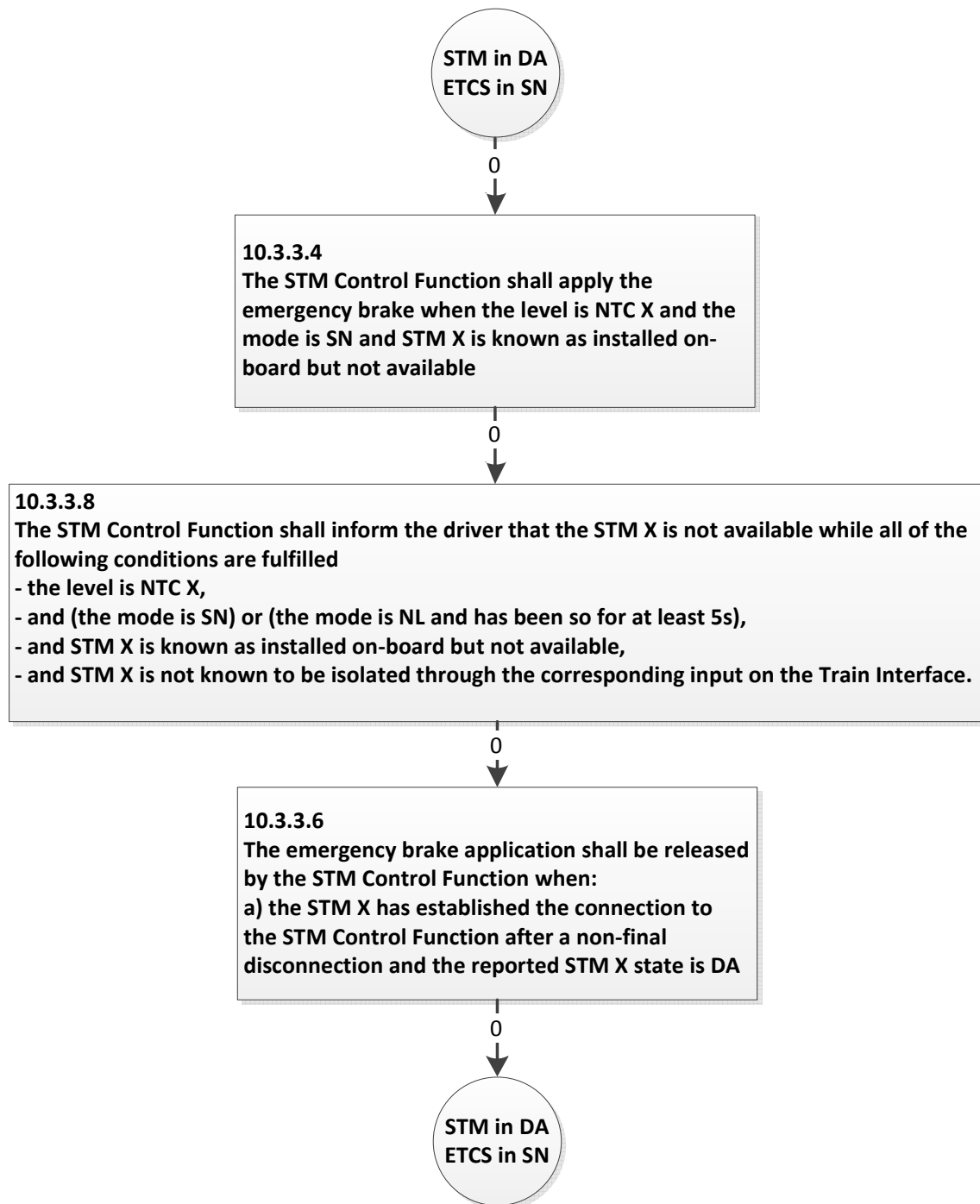
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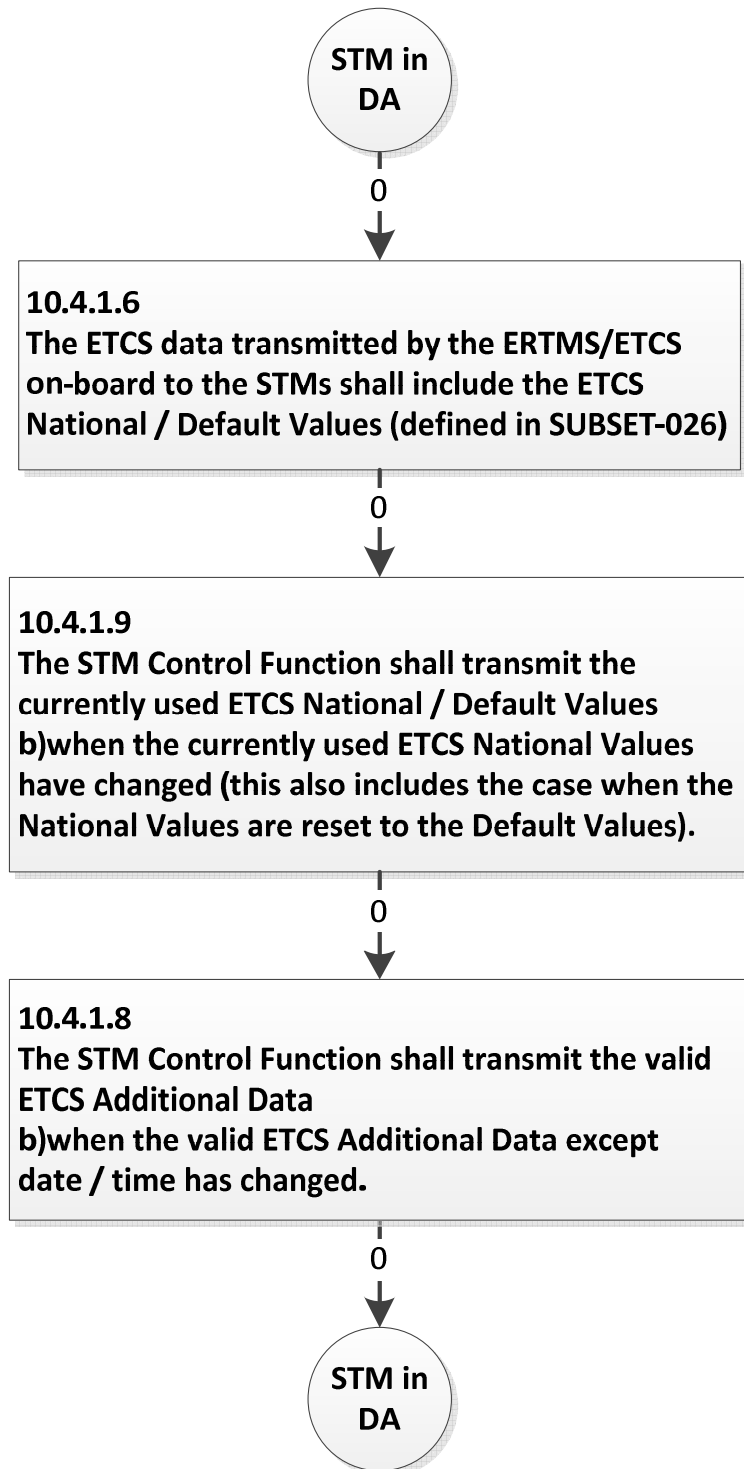
6f



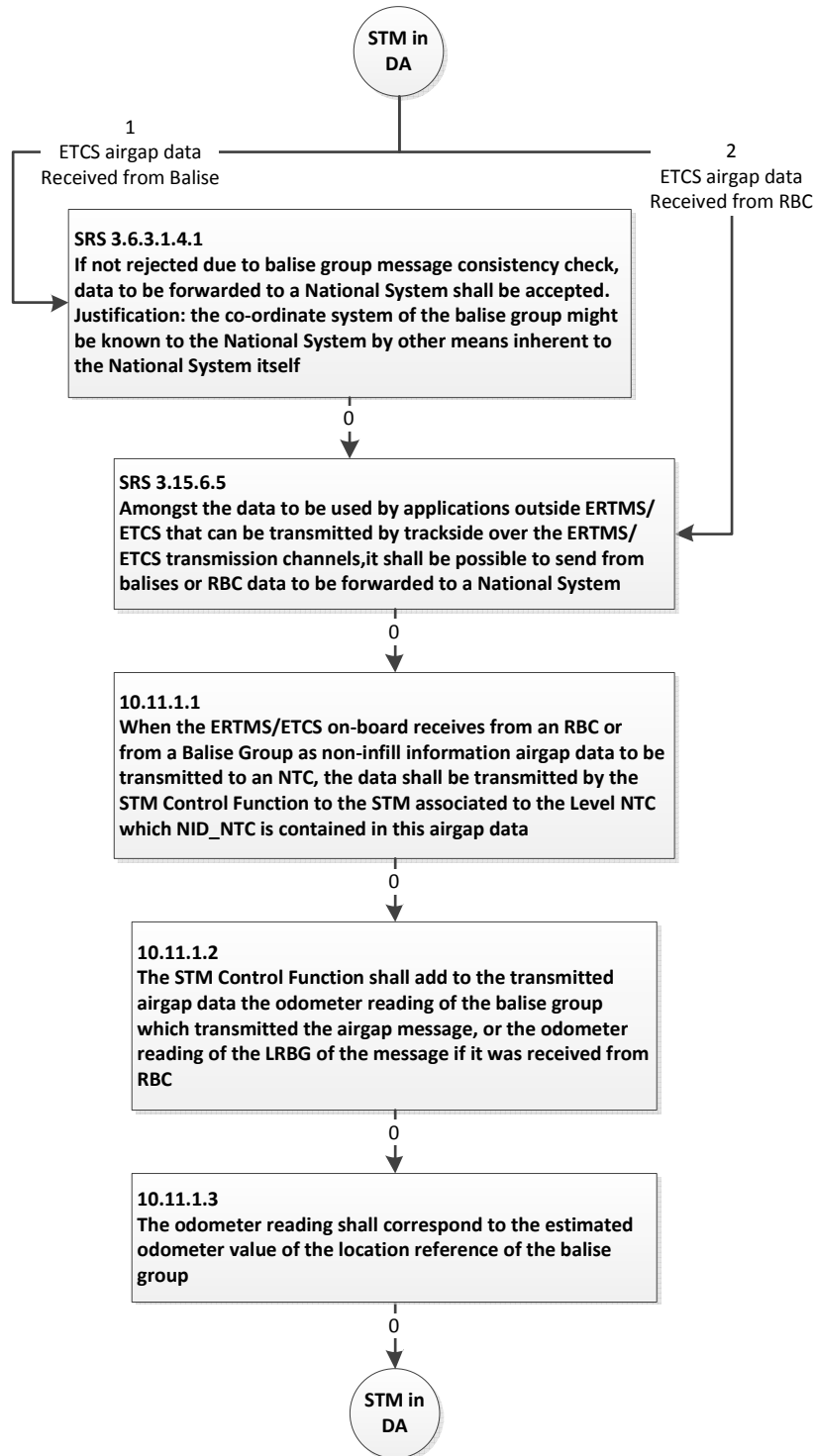
6g



6h



6i





Supplier-specific delays table

| # | Supplier of | Start time | End time |
|------|-------------|---|--|
| Ts1 | ETCS | Timestamp of message including STM-130 "Traction Cut Off" | Timestamp of message including STM-139 "Traction status" |
| Ts2 | ETCS | Timestamp of message including STM-161 | Reference time at which the message to the On-Board Recording Device is sent |
| Ts3 | ETCS | Timestamp of message including STM-128 "Apply SB" | Reference time at which the Service Brake braking is displayed |
| Ts4 | ETCS | Reference time at which Service Brake failure occurs while commanded | Timestamp of message including STM-136 "SB not available" |
| Ts5 | ETCS | Timestamp of message including STM-128 "Release SB" | Reference time at which the Service Brake braking is removed |
| Ts6 | ETCS | Timestamp of message including STM-128 "Apply EB" | Reference time at which the Emergency Brake braking is displayed |
| Ts7 | ETCS | Reference time at which Service Brake failure occurs while commanded | Reference time at which the Emergency Brake is applied |
| Ts8 | ETCS | Reference time at which Service Brake failure occurs while commanded | Reference time at which the Emergency Brake braking is displayed |
| Ts9 | ETCS | Reference time at which ETCS is powered on | Timestamp of message including STM-8 |
| Ts10 | ETCS | Reference time at which ETCS is powered on | Timestamp of message including STM-9 |
| Ts11 | ETCS | Reference time at which ETCS (with "sleeping" input signal activated) is powered on | Reference time at which the train is in Sleeping mode |
| Ts12 | ETCS | Reference time at which Connection between STM and STM Control Function is cut | Reference time at which the Emergency Brake is applied |
| Ts13 | ETCS | Reference time at which Connection between STM and STM Control Function is cut | Reference time at which the message "NTC X is not available" is displayed |
| Ts14 | ETCS | Timestamp of message including STM-1 | Reference time at which the Emergency Brake is released |

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| | | | |
|------|------|--|---|
| Ts15 | ETCS | Timestamp of message including STM-1 | Reference time at which the message “NTC X is not available” is removed |
| Ts16 | ETCS | Reference time at which is received a message including "National Values" immediately applicable | Timestamp of message including STM-178 |
| Ts17 | ETCS | Reference time at which a balise group is received | Reference time at which a “Position Report” message is sent |



TEST CASE 6a.1

| TEST CASE HEADER | |
|---|--|
| Test Case Identification | Data Available functionality |
| | 6a.0.0.0.0.0.0.0 |
| | Train interface command signals (STM specific brake control command) |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 5.2.4.3 (special brakes), 5.3.1.1 (TIU command) |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-15, STM-129 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | |



| Starting Conditions | Value | Comments |
|--|---|--|
| STM State | DA | |
| ETCS Mode | SL, NL, SN | All of these modes (several test executions) |
| ETCS Level | NTC | |
| Train State | Not Relevant | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Established | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Allow | |
| TIU Magnetic Shoes Brake Command | Allow | |
| TIU Eddy Current Brake Command for Emergency Brake | Allow | |
| TIU Eddy Current Brake Command for Service Brake | Allow | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | SL: No cab active NL/SN: Cab A or Cab B active | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not isolated | |

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ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|---|-----------|------------|---|------------|-------------------|------------------------------|
| 1 | The STM issues inhibition command signals for all brakes | PROF | T0 | Message-1 (Packet STM-15; Packet STM-129) | TIU | | Check on the Train Interface |
| 2 | The STM issues an allow command signal for "Regenerative Brake" | PROF | T0 + 5s | Message-2 (Packet STM-15; Packet STM-129) | TIU | | Check on the Train Interface |
| 3 | The STM issues an allow command signal for "Magnetic shoes" | PROF | T0 + 10s | Message-3 (Packet STM-15; Packet STM-129) | TIU | | Check on the Train Interface |
| 4 | The STM issues an allow command signal for "Eddy Current Brake for Emergency Brake" | PROF | T0 + 15s | Message-4 (Packet STM-15; Packet STM-129) | TIU | | Check on the Train Interface |
| 5 | The STM issues an allow command signal for "Eddy Current Brake for Service Brake" | PROF | T0 + 20s | Message-5 (Packet STM-15; Packet STM-129) | TIU | | Check on the Train Interface |

STM Test Case

Not applicable



| Message 1 (Packet STM-129) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 129 | Packet identifier (STM-129) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIRB_CMD | 2 | 10b | Suppress regenerative brake (off) |
| M_TIMSH_CMD | 2 | 10b | Suppress MB (off) |
| M_TIEDCBEB_CMD | 2 | 10b | Suppress eddy current brake for Emergency Brake command (off) |
| M_TIEDCBSB_CMD | 2 | 10b | Suppress eddy current brake for Service Brake command (off) |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 2 (Packet STM-129) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 129 | Packet identifier (STM-129) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIRB_CMD | 2 | 01b | Allow regenerative brake (on) |
| M_TIMSH_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIEDCBEB_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIEDCBSB_CMD | 2 | 11b | No command from STM → Keep current output status |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 3 (Packet STM-129) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 129 | Packet identifier (STM-129) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIRB_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIMSH_CMD | 2 | 01b | Allow MB (on) |
| M_TIEDCBEB_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIEDCBSB_CMD | 2 | 11b | No command from STM → Keep current output status |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 4 (Packet STM-129) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 129 | Packet identifier (STM-129) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIRB_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIMSH_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIEDCBEB_CMD | 2 | 01b | Allow eddy current brake for Emergency Brake command (on) |
| M_TIEDCBSB_CMD | 2 | 11b | No command from STM → Keep current output status |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 5 (Packet STM-129) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 129 | Packet identifier (STM-129) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIRB_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIMSH_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIEDCBEB_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIEDCBSB_CMD | 2 | 01b | Allow eddy current brake for Service Brake command (on) |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|----------|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Not Relevant | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Unchanged | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Unchanged | |
| TIU Magnetic Shoes Brake Command | Unchanged | |
| TIU Eddy Current Brake Command for Emergency Brake | Unchanged | |
| TIU Eddy Current Brake Command for Service Brake | Unchanged | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Unchanged | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Unchanged | |



TEST CASE 6b.1

| TEST CASE HEADER | |
|---|---|
| Test Case Identification | Data Available functionality |
| | 6b.0.0.0.0.0.0 |
| | Train interface command signals (STM commands to train interface) |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 5.2.4.3, 5.2.4.4, 5.3.1.1 (TIU command), 11.1.1.1 a) |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-15, STM-130, STM-139 |
| ERTMS/ETCS on-board Configuration | ERTMS/ETCS on-board must be configured for the complete set of train interface signals. |
| Comments and constraints | |



| Starting Conditions | Value | Comments |
|--|--------------|--|
| STM State | DA | |
| ETCS Mode | SL, NL, SN | All of these modes (several test executions) |
| ETCS Level | NTC | |
| Train State | Not Relevant | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Established | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Cut | |
| TIU Traction Status | On | |
| TIU Direction Controller Position Status | Forward | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not isolated | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|---|-----------|------------|---|------------|-------------------|--|
| 1 | The STM issues command signals for all TIU commands but brakes inhibition | PROF | T0 | Message-1 (Packet STM-15; Packet STM-130) | TIU | | Check on the Train Interface |
| 2 | The STM issues a “Pantograph” command signal | PROF | T0 + 5s | Message-2 (Packet STM-15; Packet STM-130) | TIU | | Check on the Train Interface |
| 3 | The STM issues a “Air Tightness” command signal | PROF | T0 + 10s | Message-3 (Packet STM-15; Packet STM-130) | TIU | | Check on the Train Interface |
| 4 | The STM issues an “Main Switch / Circuit Breaker” command signal | PROF | T0 + 15s | Message-4 (Packet STM-15; Packet STM-130) | TIU | | Check on the Train Interface |
| 5 | The STM issues a “Traction Cut Off” command signal | PROF | T0 + 20s | Message-5 (Packet STM-15; Packet STM-130) | PROF | Ts1 | Message-6 (Packet STM-139) is sent by the ERTMS /ETCS on-board to notify the STM about the change of status. |
| | | | | | TIU | | Check on the Train Interface |

STM Test Case

Not applicable



| Message 1 (Packet STM-130) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 130 | Packet identifier (STM-130) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIPANTO_CMD | 2 | 10b | Pantograph lower |
| M_TIFLAP_CMD | 2 | 10b | Flap close (air conditioning off) |
| M_TIMS_CMD | 2 | 10b | Main switch open (off) |
| M_TITR_C_CMD | 2 | 10b | No traction cut off |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 2 (Packet STM-130) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 130 | Packet identifier (STM-130) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIPANTO_CMD | 2 | 01b | Pantograph lift |
| M_TIFLAP_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIMS_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TITR_C_CMD | 2 | 11b | No command from STM → Keep current output status |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 3 (Packet STM-130) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 130 | Packet identifier (STM-130) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIPANTO_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIFLAP_CMD | 2 | 01b | Flap open (air conditioning on) |
| M_TIMS_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TITR_C_CMD | 2 | 11b | No command from STM → Keep current output status |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 4 (Packet STM-130) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 130 | Packet identifier (STM-130) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIPANTO_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIFLAP_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIMS_CMD | 2 | 01b | Main switch close (on) |
| M_TITR_C_CMD | 2 | 11b | No command from STM → Keep current output status |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 5 (Packet STM-130) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 130 | Packet identifier (STM-130) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIPANTO_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIFLAP_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIMS_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TITR_C_CMD | 2 | 01b | Traction cut off |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 6 (Packet STM-139) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 139 | Packet identifier (STM-139) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TITR_STATUS | 2 | 01b | Traction off |
| M_TIDIR_STATUS | 3 | 001b | Forward |
| M_TICAB_STATUS | 2 | 01b | Cab A active |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|----------|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Not Relevant | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Unchanged | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Lift | |
| TIU Air Tightness Command | Open | |
| TIU Main Switch / Circuit Breaker Command | Closed | |
| TIU Traction Cut Off Command | Cut | |
| TIU Traction Status | Off | |
| TIU Direction Controller Position Status | Unchanged | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Unchanged | |



TEST CASE 6c.1

| TEST CASE HEADER | |
|---|--|
| Test Case Identification | Data Available functionality |
| | 6c.0.0.0.0.0 |
| | Train interface command and status signals |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 5.2.4.4, 11.1.1.1 a) |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-15, STM-130, STM-139 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | |



| Starting Conditions | Value | Comments |
|--|--------------|----------|
| STM State | DA | |
| ETCS Mode | SN | |
| ETCS Level | NTC | |
| Train State | Standstill | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Established | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | On | |
| TIU Direction Controller Position Status | Forward | |
| TIU Cab Status | Cab A active | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not isolated | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|---|-----------|------------|--|------------|-------------------|--|
| 1 | The STM issues command signals for all TIU commands (but brakes) inhibition | PROF | T0 | Message-1 (Packet STM-15; Packet STM-130) | TIU | | Check on the Train Interface |
| 2 | The STM issues a "Traction Cut Off" command signal | PROF | T0 + 5s | Message-2 (Packet STM-15; Packet STM-130) | PROF | Ts1 | Message-3 (Packet STM-139) is sent by the ERTMS /ETCS on-board to notify the STM about the change of status. |
| 3 | Direction controller change from Forward to Neutral | TIU | T0 + 10s | Direction controller change from Forward to Neutral | PROF | | Message-4 (Packet STM-139) is sent by the ERTMS /ETCS on-board to notify the STM about the change of status. |
| 4 | Direction controller change from Neutral to Backward | TIU | T0 + 15s | Direction controller change from Neutral to Backward | PROF | | Message-5 (Packet STM-139) is sent by the ERTMS /ETCS on-board to notify the STM about the change of status. |
| 5 | Direction controller change from Backward to Neutral | TIU | T0 + 20s | Direction controller change from Backward to Neutral | PROF | | Message 4 (Packet STM-139) is sent by the ERTMS /ETCS on-board to notify the STM about the change of status. |
| 6 | Direction controller change from Neutral to Forward | TIU | T0 + 25s | Direction controller change from Neutral to Forward | PROF | | Message 3 (Packet STM-139) is sent by the ERTMS /ETCS on-board to notify the STM about the change of status. |
| 7 | Cab A closed | TIU | T0 + 30s | Cab A closed | PROF | | Message 6 (Packet STM-139) is sent by the ERTMS /ETCS on-board to notify the STM about the change of status. |
| 8 | Cab B active | TIU | T0 + 35s | Cab B active | PROF | | Message 7 (Packet STM-139) is sent by the ERTMS /ETCS on-board to notify the STM about the change of status. |

STM Test Case

Not applicable

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| Message 1 (Packet STM-130) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 130 | Packet identifier (STM-130) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIPANTO_CMD | 2 | 10b | Pantograph lower |
| M_TIFLAP_CMD | 2 | 10b | Flap close (air conditioning off) |
| M_TIMS_CMD | 2 | 10b | Main switch open (off) |
| M_TITR_C_CMD | 2 | 10b | No traction cut off |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 2 (Packet STM-130) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 130 | Packet identifier (STM-130) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TIPANTO_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIFLAP_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TIMS_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_TITR_C_CMD | 2 | 01b | Traction cut off |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |

| Message 3 (Packet STM-139) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 139 | Packet identifier (STM-139) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TITR_STATUS | 2 | 01b | Traction off |
| M_TIDIR_STATUS | 3 | 001b | Forward |
| M_TICAB_STATUS | 2 | 01b | Cab A active |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |

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| Message 4 (Packet STM-139) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 139 | Packet identifier (STM-139) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TITR_STATUS | 2 | 01b | Traction off |
| M_TIDIR_STATUS | 3 | 010b | Neutral |
| M_TICAB_STATUS | 2 | 01b | Cab A active |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |

| Message 5 (Packet STM-139) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 139 | Packet identifier (STM-139) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TITR_STATUS | 2 | 01b | Traction off |
| M_TIDIR_STATUS | 3 | 100b | Backward |
| M_TICAB_STATUS | 2 | 01b | Cab A active |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 6 (Packet STM-139) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 139 | Packet identifier (STM-139) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TITR_STATUS | 2 | 01b | Traction off |
| M_TIDIR_STATUS | 3 | 001b | Forward |
| M_TICAB_STATUS | 2 | 11b | No cab active |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |

| Message 7 (Packet STM-139) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 139 | Packet identifier (STM-139) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_TITR_STATUS | 2 | 01b | Traction off |
| M_TIDIR_STATUS | 3 | 001b | Forward |
| M_TICAB_STATUS | 2 | 10b | Cab B active |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|------------------|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Not Relevant | |
| ETCS Train Data | Unchanged | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Unchanged | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Cut | Traction cut off |
| TIU Traction Status | Off | |
| TIU Direction Controller Position Status | Forward | |
| TIU Cab Status | Cab B active | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Unchanged | |



TEST CASE 6d.1

TEST CASE HEADER

| | |
|--|--|
| Test Case Identification | Data Available functionality |
| | 6d.0.0.0 |
| | STM information to the On-Board Recording Device |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 5.2.6.1, 14.1.1.1 |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-15, STM-161 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | |



| Starting Conditions | Value | Comments |
|--|--------------|----------|
| STM State | DA | |
| ETCS Mode | SN | |
| ETCS Level | NTC | |
| Train State | Not Relevant | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Established | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not isolated | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|------------------------------|-----------|------------|---|------------|-------------------|-----------------------------|
| 1 | The STM sends juridical data | PROF | T0 | Message-1 (Packet STM-15; Packet STM-161) | JD | Ts2 | Message-2 (STM INFORMATION) |

STM Test Case

Not applicable



| Message 1 (Packet STM-161) : STM → ETCS | | | |
|---|--------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 161 | Packet identifier (STM-161) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_JD | 32 | FINITE VALUE | Time Stamp |
| N_LITER | 8 | 18 | Number of iterations of a data set following |
| M_DATA(1) | 8 | "S" | |
| M_DATA(2) | 8 | "T" | |
| M_DATA(3) | 8 | "M" | |
| M_DATA(4) | 8 | " " | |
| M_DATA(5) | 8 | "J" | |
| M_DATA(6) | 8 | "u" | |
| M_DATA(7) | 8 | "r" | |
| M_DATA(8) | 8 | "i" | |
| M_DATA(9) | 8 | "d" | |
| M_DATA(10) | 8 | "l" | |
| M_DATA(11) | 8 | "c" | |
| M_DATA(12) | 8 | "a" | |
| M_DATA(13) | 8 | "l" | |
| M_DATA(14) | 8 | " " | |
| M_DATA(15) | 8 | "D" | |
| M_DATA(16) | 8 | "a" | |

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| Message 1 (Packet STM-161) : STM → ETCS | | | |
|---|----------|--------------|-------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| M_DATA(17) | 8 | "t" | |
| M_DATA(18) | 8 | "a" | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 2 : ETCS → On-Board Recording Device | | | |
|--|---------|--------------|--|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_MESSAGE | 8 | 14 | Message identification number (STM INFORMATION) |
| L_MESSAGE | 11 | COMPUTED | Message length |
| YEAR | 7 | FINITE VALUE | Official year |
| MONTH | 4 | FINITE VALUE | Official month |
| DAY | 5 | FINITE VALUE | Official day |
| HOURL | 5 | FINITE VALUE | Official hour |
| MINUTES | 6 | FINITE VALUE | Official minutes |
| SECONDS | 6 | FINITE VALUE | Official seconds |
| TTS | 5 | FINITE VALUE | Official hundredth of second |
| Q_SCALE | 2 | FINITE VALUE | Qualifier for the distance scale (10cm, 1m, 10m) |
| NID_LRBG | 10 + 14 | FINITE VALUE | Identity of last relevant balise group |
| D_LRBG | 15 | FINITE VALUE | Distance between the last relevant balise group and the estimated front end of the train (depends on Q_SCALE) |
| Q_DIRLRBG | 2 | FINITE VALUE | Orientation of the train in relation to the direction of the LRBG |
| Q_DLRBG | 2 | FINITE VALUE | Qualifier telling on which side of the LRBG the estimated front end is |
| L_DOUBTOVER | 15 | FINITE VALUE | Over-reading amount plus the Q_LOCACC (accuracy of the balise location) of the LRBG |
| L_DOUBTUNDER | 15 | FINITE VALUE | Under-reading amount plus the Q_LOCACC (accuracy of the balise location) of the LRBG |
| V_TRAIN | 10 | FINITE VALUE | Current train speed |
| DRIVER_ID | 128 | FINITE VALUE | Driver identifier |
| NID_ENGINE | 24 | FINITE VALUE | The ETCS identity number is uniquely defined for ERTMS/ETCS purposes |
| M_VERSION | 7 | 010 0000 | Version of the ETCS system (Version 2.0, introduced in SRS 3.3.0) |
| M_LEVEL | 3 | 1 | Current Operating level (Level NTC) |

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| Message 2 : ETCS → On-Board Recording Device | | | |
|--|--------|--------------|--|
| VARIABLE | Length | VALUE | COMMENTS |
| M_MODE | 4 | 13 | On-board Operating mode (National System) |
| NID_STMX | 8 | FINITE VALUE | STM identification |
| NID_STMEVENT | 2 | 2 | STM Event type (Reception/sending of STM packet) |
| NID_STMPACKET | 8 | 161 | STM packet identification (NTC juridical data from STM) |
| L_STMPACKET | 13 | FINITE VALUE | Length of STM packet (L_STMPACKET = L_PACKET of Message 1) |
| T_JD | 32 | FINITE VALUE | Time Stamp |
| N_LITER | 8 | 18 | Number of iterations of a data set following |
| M_DATA(1) | 8 | "S" | |
| M_DATA(2) | 8 | "T" | |
| M_DATA(3) | 8 | "M" | |
| M_DATA(4) | 8 | " " | |
| M_DATA(5) | 8 | "J" | |
| M_DATA(6) | 8 | "U" | |
| M_DATA(7) | 8 | "I" | |
| M_DATA(8) | 8 | "I" | |
| M_DATA(9) | 8 | "d" | |
| M_DATA(10) | 8 | "i" | |
| M_DATA(11) | 8 | "c" | |
| M_DATA(12) | 8 | "a" | |
| M_DATA(13) | 8 | "I" | |
| M_DATA(14) | 8 | " " | |
| M_DATA(15) | 8 | "D" | |
| M_DATA(16) | 8 | "a" | |
| M_DATA(17) | 8 | "t" | |
| M_DATA(18) | 8 | "a" | |

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| Message 2 : ETCS → On-Board Recording Device | | | |
|--|----------|--------------|-------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|----------|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Not Relevant | |
| ETCS Train Data | Unchanged | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Unchanged | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Unchanged | |



TEST CASE 6e.1

| TEST CASE HEADER | |
|---|--|
| Test Case Identification | Data Available functionality |
| | 6e.0.0.0.1 |
| | Brake interface command access. The Service Brake shall not be backed up with an Emergency Brake command |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 5.3.1.1 (BIU command), 11.1.1.3 a), 11.1.1.4 |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-15, STM-128, STM-136 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | |



| Starting Conditions | Value | Comments |
|--|--------------|----------|
| STM State | DA | |
| ETCS Mode | SN | |
| ETCS Level | NTC | |
| Train State | Not Relevant | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Established | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Release | |
| BIU Service Brake Command | Release | |
| BIU Emergency Brake Status | Available | |
| BIU Service Brake Status | Available | |
| NTC isolation status | Not isolated | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|--|-----------|------------|---|------------|-------------------|--|
| 1 | The STM issues a "Service brake" command to apply the Service Brake | PROF | T0 | Message-1 (Packet STM-15; Packet STM-128) | TIU | | Check on the Train Interface |
| | | | | | DMI | Ts3 | Check on the DMI |
| 2 | The Service Brake fails (The way to provoke the Service Brake failure is specific to the ERTMS/ETCS on-board supplier) | TIU | T0 + 5s | The Service Brake fails | PROF | Ts4 | Message-2 (Packet STM-136) is sent by the ERTMS /ETCS on-board to notify the STM about the change of status. |
| | | | | | TIU | | Check on the Train Interface that the Emergency Brake is not applied |
| 3 | The STM issues a "Service brake" command to release the Service Brake | PROF | T0 + 10s | Message-3 (Packet STM-15; Packet STM-128) | TIU | | Check on the Train Interface |
| | | | | | DMI | Ts5 | Check on the DMI |
| 4 | The STM issues a "Emergency brake" command to apply the Emergency Brake | PROF | T0 + 11s | Message-4 (Packet STM-15; Packet STM-128) | TIU | | Check on the Train Interface |
| | | | | | DMI | Ts6 | Check on the DMI |

STM Test Case

Not applicable



| Message 1 (Packet STM-128) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 128 | Packet identifier (STM-128) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_BIEB_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_BISB_CMD | 2 | 01b | Apply SB |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |

| Message 2 (Packet STM-136) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 136 | Packet identifier (STM-136) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_BIEB_STATUS | 2 | 10b | Available |
| M_BISB_STATUS | 2 | 00b | Fail |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 3 (Packet STM-128) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 128 | Packet identifier (STM-128) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_BIEB_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_BISB_CMD | 2 | 10b | Release SB |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |

| Message 4 (Packet STM-128) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 128 | Packet identifier (STM-128) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_BIEB_CMD | 2 | 01b | Apply EB |
| M_BISB_CMD | 2 | 11b | No command from STM → Keep current output status |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |

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| End Conditions | Value | Comments |
|--|--------------|--|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Not Relevant | The train could be moving while braking or could have reached standstill |
| ETCS Train Data | Unchanged | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Unchanged | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Apply | |
| BIU Service Brake Command | Unchanged | |
| BIU Emergency Brake Status | Unchanged | |
| BIU Service Brake Status | Fail status | |
| NTC isolation status | Unchanged | |



TEST CASE 6e.2

TEST CASE HEADER

| | |
|--|--|
| Test Case Identification | Data Available functionality |
| | 6e.0.0.0.2 |
| | Brake interface command access. The Service Brake shall be backed up with an Emergency Brake command |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 5.3.1.1 (BIU command), 11.1.1.3 a), 11.1.1.4 |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-15, STM-128 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | |



| Starting Conditions | Value | Comments |
|--|--------------|----------|
| STM State | DA | |
| ETCS Mode | SN | |
| ETCS Level | NTC | |
| Train State | Not Relevant | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Established | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Release | |
| BIU Service Brake Command | Release | |
| BIU Emergency Brake Status | Available | |
| BIU Service Brake Status | Available | |
| NTC isolation status | Not isolated | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|---|-----------|------------|---|------------|-------------------|--|
| 1 | The STM issues a "Service brake" command to apply the Service Brake | PROF | T0 | Message-1 (Packet STM-15; Packet STM-128) | TIU | | Check on the Train Interface |
| | | | | | DMI | Ts3 | Check on the DMI |
| 2 | The Service Brake fails (The way to provoke the Service Brake failure is specific to the ERTMS/ETCS on-board supplier) | TIU | T0 + 5s | The Service Brake fails | TIU | Ts7 | Check on the Train Interface that the Emergency Brake is applied |
| | | | | | DMI | Ts8 | Check on the DMI that the Emergency Brake is applied |

STM Test Case

Not applicable



| Message 1 (Packet STM-128) : STM → ETCS | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| NID_PACKET | 8 | 128 | Packet identifier (STM-128) |
| L_PACKET | 13 | COMPUTED | Packet length |
| M_BIEB_CMD | 2 | 11b | No command from STM → Keep current output status |
| M_BISB_CMD | 2 | 00b | Apply SB, or EB in case the SB fails to be applied |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|-------------------------|----------|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Standstill | |
| ETCS Train Data | Unchanged | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Unchanged | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Unchanged | |
| BIU Emergency Brake Command | Apply | |
| BIU Service Brake Command | Apply with EB fall-back | |
| BIU Emergency Brake Status | Unchanged | |
| BIU Service Brake Status | Fail status | |
| NTC isolation status | Unchanged | |



TEST CASE 6f.1

| TEST CASE HEADER | |
|---|---|
| Test Case Identification | Data Available functionality |
| | 6f.1.0.0 |
| | Odometer information (positive movement) |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 12.1.1.2, 12.1.1.3, 12.1.1.4, 12.1.1.7, 12.2.1.1, 12.3.1.6, 12.4.1.1 |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-8, STM-9 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | The “sleeping” input signal is activated. All desks connected to the ERTMS/ETCS on-board equipment are closed. |



| Starting Conditions | Value | Comments |
|--|---------------|----------|
| STM State | NP | |
| ETCS Mode | NP | |
| ETCS Level | NTC | |
| Train State | Standstill | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | No cab active | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not Relevant | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|---|-----------|-------------------------------|---|------------|-------------------|--|
| 1 | ETCS is powered up | - | T0 | ETCS is powered up | PROF | Ts9 | Message-1 (Packet STM-8) Odometer multicast |
| | | | | | PROF | Ts10 | Message-2 (Packet STM-9) |
| 2 | The train begins to move in positive direction with an acceleration of 1 m/s ² | ODO | T1 = Max (Ts9, Ts10, Ts11) | Movement in positive direction with an acceleration of 1 m/s ² | PROF | | Message-3 (Packet STM-8) Odometer multicast |
| | | | | | PROF | 7s | Message-2 (Packet STM-9) |
| 3 | Train is accelerating to reach a speed of 20 m/s | ODO | T1+ 7s | Movement in positive direction with an acceleration of 1 m/s ² | PROF | | Message-4 (Packet STM-8) Odometer multicast Check that: <ul style="list-style-type: none"> D_MIN ≤ D_EST ≤ D_MAX V_MIN ≤ V_EST ≤ V_MAX V_XXX > 0 V_XXX (Message-4) > V_XXX (Message-3) |
| | | | | | PROF | 7s | Message-2 (Packet STM-9) |
| 4 | The train reaches a speed of 20 m/s | ODO | T1 + 20s | Movement in positive direction at constant speed | PROF | | Message-5 (Packet STM-8) Odometer multicast Check that: <ul style="list-style-type: none"> D_MIN ≤ D_EST ≤ D_MAX V_MIN ≤ V_EST ≤ V_MAX V_XXX > 0 V_XXX (Message-5) > V_XXX (Message-4) |

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| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|--|-----------|------------|--|------------|-------------------|---|
| | | | | | PROF | 7s | Message-2 (Packet STM-9) |
| 5 | The train runs at a constant speed of 20 m/s | ODO | T1 + 27s | Movement in positive direction at constant speed | PROF | | Message-6 (Packet STM-8) Odometer multicast Check that: <ul style="list-style-type: none"> • $D_MIN \leq D_EST \leq D_MAX$ • $V_MIN \leq V_EST \leq V_MAX$ • $V_XXX > 0$ • V_XXX (Message-6) = V_XXX (Message-5)(*) (*)With a margin of ± 1 Km/h |
| | | | | | PROF | 7s | Message-2 (Packet STM-9) |
| | | | | | DMI | | Check that speed displayed is the same as V_EST within Packet STM-8 (*) (*) With a margin of ± 1 Km/h |

STM Test Case

Not applicable



| Message 1 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | 0 | Standstill |
| V_EST | 16 | 0 | Standstill |
| V_MIN | 16 | 0 | Standstill |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 2 (Packet STM-9) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 9 | Packet identifier (STM-9) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODOCYCLE | 8 | FINITE VALUE | |
| T_ODOMAXPROD | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 3 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | Positive or null value |
| V_EST | 16 | FINITE VALUE | Positive or null value |
| V_MIN | 16 | FINITE VALUE | Positive or null value |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 4 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | Positive value |
| V_EST | 16 | FINITE VALUE | Positive value |
| V_MIN | 16 | FINITE VALUE | Positive value |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 5 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | Positive value |
| V_EST | 16 | FINITE VALUE | Positive value |
| V_MIN | 16 | FINITE VALUE | Positive value |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 6 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | Positive value |
| V_EST | 16 | FINITE VALUE | Positive value |
| V_MIN | 16 | FINITE VALUE | Positive value |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|----------|
| STM State | Not Relevant | |
| ETCS Mode | SL | |
| ETCS Level | Not Relevant | |
| Train State | Moving | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Unchanged | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not Relevant | |



TEST CASE 6f.2

TEST CASE HEADER

| | |
|--|---|
| Test Case Identification | Data Available functionality |
| | 6f.2.0.0 |
| | Odometer information (negative movement) |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 12.1.1.2, 12.1.1.3, 12.1.1.5, 12.1.1.7, 12.2.1.1, 12.3.1.6, 12.4.1.1 |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-8, STM-9 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | The “sleeping” input signal is activated. All desks connected to the ERTMS/ETCS on-board equipment are closed. |



| Starting Conditions | Value | Comments |
|--|---------------|----------|
| STM State | NP | |
| ETCS Mode | NP | |
| ETCS Level | Not Relevant | |
| Train State | Standstill | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | No cab active | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not Relevant | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|---|-----------|-------------------------------|---|------------|-------------------|--|
| 1 | ETCS is powered up | - | T0 | ETCS is powered up | PROF | Ts9 | Message-1 (Packet STM-8) Odometer multicast |
| | | | | | PROF | Ts10 | Message-2 (Packet STM-9) |
| 2 | The train begins to move in negative direction with an acceleration of 1 m/s ² | ODO | T1 = Max (Ts9, Ts10, Ts11) | Movement in negative direction with an acceleration of 1 m/s ² | PROF | | Message-3 (Packet STM-8) Odometer multicast |
| | | | | | PROF | 7s | Message-2 (Packet STM-9) |
| 3 | Train is accelerating to reach a speed of 20 m/s | ODO | T1 + 7s | Movement in negative direction with an acceleration of 1 m/s ² | PROF | | Message-4 (Packet STM-8) Odometer multicast Check that: <ul style="list-style-type: none"> D_MIN ≤ D_EST ≤ D_MAX V_MIN ≤ V_EST ≤ V_MAX V_XXX < 0 V_XXX (Message-4) < V_XXX (Message-3) |
| | | | | | PROF | 7s | Message-2 (Packet STM-9) |
| 4 | The train reaches a speed of 20 m/s | ODO | T1 + 20s | Movement in negative direction at constant speed | PROF | | Message-5 (Packet STM-8) Odometer multicast Check that: <ul style="list-style-type: none"> D_MIN ≤ D_EST ≤ D_MAX V_MIN ≤ V_EST ≤ V_MAX V_XXX < 0 V_XXX (Message-5) < V_XXX (Message-4) |

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| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|--|-----------|------------|--|------------|-------------------|---|
| | | | | | PROF | 7s | Message-2 (Packet STM-9) |
| 5 | The train runs at a constant speed of 20 m/s | ODO | T1 + 27s | Movement in negative direction at constant speed | PROF | | Message-6 (Packet STM-8) Odometer multicast Check that: <ul style="list-style-type: none"> • $D_MIN \leq D_EST \leq D_MAX$ • $V_MIN \leq V_EST \leq V_MAX$ • $V_XXX < 0$ • $V_XXX \text{ (Message-6)} \leq V_XXX \text{ (Message-5)}$ |
| | | | | | PROF | 7s | Message-2 (Packet STM-9) |
| | | | | | DMI | | Check that speed displayed is the same as the absolute value of V_EST within Packet STM-8 (*) (*)With a margin of ± 1 Km/h |

STM Test Case

Not applicable



| Message 1 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | 0 | Standstill |
| V_EST | 16 | 0 | Standstill |
| V_MIN | 16 | 0 | Standstill |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 2 (Packet STM-9) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 9 | Packet identifier (STM-9) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODOCYCLE | 8 | FINITE VALUE | |
| T_ODOMAXPROD | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 3 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | Negative or null value |
| V_EST | 16 | FINITE VALUE | Negative or null value |
| V_MIN | 16 | FINITE VALUE | Negative or null value |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 4 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | Negative value |
| V_EST | 16 | FINITE VALUE | Negative value |
| V_MIN | 16 | FINITE VALUE | Negative value |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 5 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | Negative value |
| V_EST | 16 | FINITE VALUE | Negative value |
| V_MIN | 16 | FINITE VALUE | Negative value |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 6 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | Negative value |
| V_EST | 16 | FINITE VALUE | Negative value |
| V_MIN | 16 | FINITE VALUE | Negative value |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|----------|
| STM State | CS | |
| ETCS Mode | SL | |
| ETCS Level | Not Relevant | |
| Train State | Moving | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Unchanged | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not Relevant | |



TEST CASE 6g.1

TEST CASE HEADER

| | |
|--|--|
| Test Case Identification | Data Available functionality |
| | 6g.0.0.0 |
| | STM reconnection after non-final disconnection |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 10.3.3.4, 10.3.3.6 a), 10.3.3.8 |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-1, STM-15 |
| ERTMS/ETCS on-board Configuration | ERTMS/ETCS on-board configured with STM X installed on-board STM X is associated to Level NTC X |
| Comments and constraints | |



| Starting Conditions | Value | Comments |
|--|--------------|----------|
| STM State | DA | |
| ETCS Mode | SN | |
| ETCS Level | NTC | |
| Train State | Not Relevant | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not isolated | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|---|-----------|-----------------------|--|------------|-------------------|---|
| 1 | Connection between STM and STM Control Function is lost | PROF | T0 | Cut communication between STM and STM Control Function | TIU | Ts12 | Check on the Train Interface that the Emergency Brake is applied |
| | | | | | DMI | Ts13 | The message "NTC X is not available" is displayed |
| 2 | Connection between STM and STM Control Function is re-established | PROF | T0 + max (Ts12, Ts13) | Message-1 (Packet STM-1; Packet STM-15) | TIU | Ts14 | Check on the Train Interface that the Emergency Brake is released |
| | | | | | DMI | Ts15 | The message "NTC X is not available" is removed |

STM Test Case

Not applicable



| Message 1 (Packet STM-1) : STM → ETCS | | | |
|---------------------------------------|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 1 | Packet identifier (STM-1) |
| L_PACKET | 13 | COMPUTED | Packet length |
| N_VERMAJOR | 8 | 4 | FFFIS STM version number, major number: X |
| N_VERMINOR | 8 | 0 | FFFIS STM version number, minor number: Y |
| NID_PACKET | 8 | 15 | Packet identifier (STM-15) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_STMSTATE | 4 | 7 | Data Available (DA) |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|----------|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Standstill | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Unchanged | |



TEST CASE 6h.1

TEST CASE HEADER

| | |
|--|---|
| Test Case Identification | Data Available functionality |
| | 6h.0.0.0.0 |
| | ETCS data (ETCS National values & ETCS Additional Data) |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 10.4.1.6, 10.4.1.8 b), 10.4.1.9 b) |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-177, STM-178 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | |



| Starting Conditions | Value | Comments |
|--|--------------|----------|
| STM State | DA | |
| ETCS Mode | SN | |
| ETCS Level | NTC | |
| Train State | Moving | |
| ETCS Train Data | Valid | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not isolated | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|----------------------------------|-----------|------------|--|------------|-------------------|---|
| 1 | New National Values are received | BTM | T0 | Telegram-B1 (Packet 3 – National values) | PROF | Ts16 | Message-1 (Packet STM-178) |
| 2 | Adhesion factor is changed | DMI | T0 + 5s | Driver changes Adhesion factor | PROF | | Message-2 (Packet STM-177) |
| 3 | Train Running Number is changed | DMI | T0 + 10s | Driver changes Train Running Number | PROF | | Message-3 (Packet STM-177) Check that: NID_OPERATIONAL_STM (Message-2) ≠ NID_OPERATIONAL_STM (Message-3) |

STM Test Case

Not applicable



| Telegram B1 : Balise → ETCS | | | |
|-----------------------------|--------|--------------|--|
| VARIABLE | Length | VALUE | COMMENTS |
| Q_UPDOWN | 1 | 1 | Balise telegram transmission direction (1: track to train) |
| M_VERSION | 7 | 010 0000 | Version of the ETCS system (Version 2.0, introduced in SRS 3.3.0) |
| Q_MEDIA | 1 | 0 | Qualifier to indicate the type of media (0: balise) |
| N_PIG | 3 | 0 | Position in Group |
| N_TOTAL | 3 | 0 | Total number of balise(s) in the group |
| M_DUP | 2 | 00b | Duplicate balise (00b: No duplicates) |
| M_MCOUNT | 8 | FINITE VALUE | Message counter |
| NID_C | 10 | FINITE VALUE | Identity number of the country or region |
| NID_BG | 14 | FINITE VALUE | Identity number of the balise group |
| Q_LINK | 1 | 0 | Link Qualifier (0: unlinked) |
| NID_PACKET | 8 | 3 | Packet identifier (3: National Values) |
| Q_DIR | 2 | 10b | Validity direction of transmitted data (Both directions) |
| L_PACKET | 13 | COMPUTED | Packet length |
| Q_SCALE | 2 | FINITE VALUE | Qualifier for the distance scale (10cm, 1m, 10m) |
| D_VALIDNV | 15 | 32767 | Distance to start of validity of national values(32767: Now (National Values are immediately applicable)) |
| NID_C | 10 | FINITE VALUE | Identification of national areas to which the set applies (NID_C equals to the previous NID_C value in header) |
| N_ITER | 5 | 0 | Number of iterations of a data set following this variable in a packet |
| V_NVSHUNT | 7 | FINITE VALUE | Shunting mode speed limit (0 – 600 Km/h) |
| V_NVSTFF | 7 | FINITE VALUE | Staff Responsible mode speed limit (0 – 600 Km/h) |
| V_NVONSIGHT | 7 | FINITE VALUE | On Sight mode speed limit (0 – 600 Km/h) |
| V_NVLIMSUPERV | 7 | FINITE VALUE | Limited Supervision mode speed limit (0 – 600 Km/h) |
| V_NVUNFIT | 7 | FINITE VALUE | Unfitted mode speed limit (0 – 600 Km/h) |
| V_NVREL | 7 | FINITE VALUE | Release Speed (0 – 600 Km/h) |

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Telegram B1 : Balise → ETCS

| VARIABLE | Length | VALUE | COMMENTS |
|------------------|--------|--------------|--|
| D_NVROLL | 15 | FINITE VALUE | Roll away distance limit (depends on Q_SCALE) |
| Q_NVSBTSMPerm | 1 | FINITE VALUE | Permission to use service brake in target speed monitoring |
| Q_NVEMRRLS | 1 | FINITE VALUE | Qualifier Emergency Brake Release |
| Q_NVGUIPERM | 1 | FINITE VALUE | Permission to use the guidance curve |
| Q_NVSBFBPerm | 1 | FINITE VALUE | Permission to use the service brake feedback |
| Q_NVINHSMICPerm | 1 | FINITE VALUE | Permission to inhibit the compensation of the speed measurement inaccuracy |
| V_NVALLOWOVTRP | 7 | FINITE VALUE | Speed limit allowing the driver to select the “override” function |
| V_NVSUPOVTRP | 7 | FINITE VALUE | Override speed limit to be supervised when the “override” function is active |
| D_NVOVTRP | 15 | FINITE VALUE | Maximum distance for overriding the train trip |
| T_NVOVTRP | 8 | FINITE VALUE | Maximum time for overriding the train trip |
| D_NVPOTRP | 15 | FINITE VALUE | Maximum distance for reversing in Post Trip mode |
| M_NVCONTACT | 2 | FINITE VALUE | Indicates the reaction to be performed when T_NVCONTACT timer elapses (Train trip, apply service brake, no reaction) |
| T_NVCONTACT | 8 | FINITE VALUE | Maximal time without new “safe” message |
| M_NVDERUN | 1 | FINITE VALUE | Entry of Driver ID permitted while running |
| D_NVSTFF | 15 | FINITE VALUE | Maximum distance for running in Staff Responsible mode |
| Q_NVDRIVER_ADHES | 1 | 1 | Qualifier for the modification of trackside adhesion factor by driver (1: allowed) |
| A_NVMAXREDADH1 | 6 | FINITE VALUE | Maximum deceleration under reduced adhesion conditions |
| A_NVMAXREDADH2 | 6 | FINITE VALUE | Maximum deceleration under reduced adhesion conditions |
| A_NVMAXREDADH3 | 6 | FINITE VALUE | Maximum deceleration under reduced adhesion conditions |
| Q_NVLOCACC | 6 | FINITE VALUE | Default accuracy of the balise location (absolute value) |
| M_NVAVADH | 5 | FINITE VALUE | Weighting factor for available wheel/rail adhesion |
| M_NVEBCL | 4 | FINITE VALUE | Confidence level for emergency brake safe deceleration on dry rails |
| Q_NVKINT | 1 | 0 | Qualifier for integrated correction factors |
| NID_PACKET | 8 | 255 | Packet identifier (255: End of Information) |

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| Telegram B1 : Balise → ETCS | | | |
|-----------------------------|----------|--------------|-------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 1 (Packet STM-178) : ETCS → STM | | | |
|---|--------|--------------|--|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 178 | Packet identifier (STM-178) |
| L_PACKET | 13 | COMPUTED | Packet length |
| Q_SCALE | 2 | FINITE VALUE | Qualifier for the distance scale (10cm, 1m, 10m) |
| V_NVSHUNT | 7 | FINITE VALUE | Shunting mode speed limit (0 – 600 Km/h) |
| V_NVSTFF | 7 | FINITE VALUE | Staff Responsible mode speed limit (0 – 600 Km/h) |
| V_NVONSIGHT | 7 | FINITE VALUE | On Sight mode speed limit (0 – 600 Km/h) |
| V_NVLIMSUPERV | 7 | FINITE VALUE | Limited Supervision mode speed limit (0 – 600 Km/h) |
| V_NVUNFIT | 7 | FINITE VALUE | Unfitted mode speed limit (0 – 600 Km/h) |
| V_NVREL | 7 | FINITE VALUE | Release Speed (0 – 600 Km/h) |
| D_NVROLL | 15 | FINITE VALUE | Roll away distance limit (depends on Q_SCALE) |
| Q_NVSBTSMPerm | 1 | FINITE VALUE | Permission to use service brake in target speed monitoring |
| Q_NVEMRRLS | 1 | FINITE VALUE | Qualifier Emergency Brake Release |
| Q_NVGUIPERM | 1 | FINITE VALUE | Permission to use the guidance curve |
| Q_NVSBFBPerm | 1 | FINITE VALUE | Permission to use the service brake feedback |
| Q_NVINHSMICPerm | 1 | FINITE VALUE | Permission to inhibit the compensation of the speed measurement inaccuracy |
| V_NVALLOWOVTRP | 7 | FINITE VALUE | Speed limit allowing the driver to select the “override” function |
| V_NVSUPOVTRP | 7 | FINITE VALUE | Override speed limit to be supervised when the “override” function is active |
| D_NVOVTRP | 15 | FINITE VALUE | Maximum distance for overriding the train trip |
| T_NVOVTRP | 8 | FINITE VALUE | Maximum time for overriding the train trip |
| D_NVPOTRP | 15 | FINITE VALUE | Maximum distance for reversing in Post Trip mode |
| M_NVCONTACT | 2 | FINITE VALUE | Indicates the reaction to be performed when T_NVCONTACT timer elapses (Train trip, apply service brake, no reaction) |
| T_NVCONTACT | 8 | FINITE VALUE | Maximal time without new “safe” message |

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| Message 1 (Packet STM-178) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| M_NVDERUN | 1 | FINITE VALUE | Entry of Driver ID permitted while running |
| D_NVSTFF | 15 | FINITE VALUE | Maximum distance for running in Staff Responsible mode |
| Q_NVDRIVER_ADHES | 1 | 1 | Qualifier for the modification of trackside adhesion factor by driver |
| A_NVMAXREDADH1 | 6 | FINITE VALUE | Maximum deceleration under reduced adhesion conditions |
| A_NVMAXREDADH2 | 6 | FINITE VALUE | Maximum deceleration under reduced adhesion conditions |
| A_NVMAXREDADH3 | 6 | FINITE VALUE | Maximum deceleration under reduced adhesion conditions |
| Q_NVLOCACC | 6 | FINITE VALUE | Default accuracy of the balise location (absolute value) |
| M_NVAVADH | 5 | FINITE VALUE | Weighting factor for available wheel/rail adhesion |
| M_NVEBCL | 4 | FINITE VALUE | Confidence level for emergency brake safe deceleration on dry rails |
| Q_NVKINT | 1 | 0 | Qualifier for integrated correction factors |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 2 (Packet STM-177) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 177 | Packet identifier (STM-177) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_ENGINE | 24 | FINITE VALUE | Onboard ETCS identity |
| M_ADHESION | 1 | 0 | Adhesion factor (0 = Slippery rail) |
| YEAR | 7 | FINITE VALUE | Official year |
| MONTH | 4 | FINITE VALUE | Official month |
| DAY | 5 | FINITE VALUE | Official day |
| HOURL | 5 | FINITE VALUE | Official hour |
| MINUTES | 6 | FINITE VALUE | Official minutes |
| SECONDS | 6 | FINITE VALUE | Official seconds |
| TTS | 5 | FINITE VALUE | Official hundredth of second |
| NID_OPERATIONAL_STM | 32 | FINITE VALUE | Train Running Number |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 3 (Packet STM-177) : ETCS → STM | | | |
|---|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 177 | Packet identifier (STM-177) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_ENGINE | 24 | FINITE VALUE | Onboard ETCS identity |
| M_ADHESION | 1 | 0 | Adhesion factor (0 = Slippery rail) |
| YEAR | 7 | FINITE VALUE | Official year |
| MONTH | 4 | FINITE VALUE | Official month |
| DAY | 5 | FINITE VALUE | Official day |
| HOURL | 5 | FINITE VALUE | Official hour |
| MINUTES | 6 | FINITE VALUE | Official minutes |
| SECONDS | 6 | FINITE VALUE | Official seconds |
| TTS | 5 | FINITE VALUE | Official hundredth of second |
| NID_OPERATIONAL_STM | 32 | FINITE VALUE | Train Running Number |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|----------|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Unchanged | |
| ETCS Train Data | Unchanged | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Unchanged | |



TEST CASE 6i.1

TEST CASE HEADER

| | |
|--|--|
| Test Case Identification | Data Available functionality |
| | 6i.1.0.0.0.0.0 |
| | ETCS airgap data received from Balise |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 10.11.1.1, 10.11.1.2, 10.11.1.3 Subset-026 : 3.6.3.1.4.1, 3.15.6.5, 7.4.2.11 |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-8, STM-45 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | Train moving at a constant speed of 100 Km/h |



| Starting Conditions | Value | Comments |
|--|--------------|----------|
| STM State | DA | |
| ETCS Mode | SN | |
| ETCS Level | NTC | |
| Train State | Moving | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | On | |
| TIU Direction Controller Position Status | Forward | |
| TIU Cab Status | Cab A active | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not isolated | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|--|-----------|------------|--|------------|-------------------|--|
| 1 | The train runs at a constant speed of 100 Km/h | ODO | T0 | Movement in positive direction at constant speed | PROF | | Message-1 (Packet STM-8) Odometer multicast |
| 2 | Airgap data is received | BTM | T0 + 0.5s | Telegram-B1 (Packet 44 - Data used by applications outside the ERTMS/ETCS system) | PROF | | Message-2 (STM-45) |
| 3 | The train runs at a constant speed of 100 Km/h | ODO | T0 + 2s | Movement in positive direction at constant speed | PROF | | Message-3 (Packet STM-8) Odometer multicast Check that D_ESTODO_BG value of Message-2 is between D_EST of Message-1 and D_EST of Message-3 |

STM Test Case

Not applicable



| Message 1 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | |
| V_EST | 16 | FINITE VALUE | |
| V_MIN | 16 | FINITE VALUE | |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Telegram B1 : Balise → ETCS | | | |
|-----------------------------|--------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| Q_UPDOWN | 1 | 1 | Direction of the information (track to train) |
| M_VERSION | 7 | 010 0000 | Version of the ETCS system (Version 2.0, introduced in SRS 3.3.0) |
| Q_MEDIA | 1 | 0 | Qualifier to indicate the type of media (0: balise) |
| N_PIG | 3 | 0 | Position in Group |
| N_TOTAL | 3 | 0 | Total number of balise(s) in the group |
| M_DUP | 2 | 00b | Duplicate balise (00b: No duplicates) |
| M_MCOUNT | 8 | FINITE VALUE | Message counter |
| NID_C | 10 | FINITE VALUE | Identity number of the country or region |
| NID_BG | 14 | FINITE VALUE | Identity number of the balise group |
| Q_LINK | 1 | FINITE VALUE | Link Qualifier |
| NID_PACKET | 8 | 44 | Packet identifier (44: Data used by applications outside the ERTMS/ETCS system) |
| Q_DIR | 2 | 00b | Validity direction of transmitted data (Reverse) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_XUSER | 9 | 102 | Identity of user system (102: National System functions) |
| NID_NTC | 8 | FINITE VALUE | National System identity (NID_NTC = NID_NTC = NID_NTC of the STM in DA) |
| N_LITER | 8 | 16 | Number of iterations of a data set following |
| M_DATA(1) | 8 | "E" | |
| M_DATA(2) | 8 | "T" | |
| M_DATA(3) | 8 | "C" | |
| M_DATA(4) | 8 | "S" | |
| M_DATA(5) | 8 | " " | |
| M_DATA(6) | 8 | "a" | |
| M_DATA(7) | 8 | "I" | |
| M_DATA(8) | 8 | "r" | |
| M_DATA(9) | 8 | "g" | |

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| Telegram B1 : Balise → ETCS | | | |
|-----------------------------|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| M_DATA(10) | 8 | "a" | |
| M_DATA(11) | 8 | "p" | |
| M_DATA(12) | 8 | " " | |
| M_DATA(13) | 8 | "d" | |
| M_DATA(14) | 8 | "a" | |
| M_DATA(15) | 8 | "t" | |
| M_DATA(16) | 8 | "a" | |
| NID_PACKET | 8 | 255 | Packet identifier (255: End of Information) |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |

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| Message 2 (Packet STM-45) : ETCS → STM | | | |
|--|--------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to (NID_STM = NID_NTC of Telegram B1) |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 45 | Packet identifier (STM-45) |
| L_PACKET | 13 | COMPUTED | Packet length |
| D_ESTODO_BG | 32 | FINITE VALUE | Value of the estimated distance given from the ERTMS/ETCS on-board Odometer Function (D_EST) at the location reference of the balise group which transmitted the airgap message |
| N_LITER | 8 | 22 | Number of iterations of a data set following |
| M_DATA(1) | 8 | 44 | NID_PACKET of Telegram B1 |
| M_DATA(2) | 8 | FINITE VALUE | Q_DIR (2 bits) + part of L_PACKET (6 bits) of Telegram B1 |
| M_DATA(3) | 8 | FINITE VALUE | part of L_PACKET (7 bits) + part of NID_XUSER (1 bit) of Telegram B1 |
| M_DATA(4) | 8 | FINITE VALUE | part of NID_XUSER (8 bits) of Telegram B1 |
| M_DATA(5) | 8 | FINITE VALUE | NID_NTC of Telegram B1 |
| M_DATA(6) | 8 | 16 | N_LITER of Telegram B1 |
| M_DATA(7) | 8 | "E" | |
| M_DATA(8) | 8 | "T" | |
| M_DATA(9) | 8 | "C" | |
| M_DATA(10) | 8 | "S" | |
| M_DATA(11) | 8 | " " | |
| M_DATA(12) | 8 | "a" | |
| M_DATA(13) | 8 | "i" | |
| M_DATA(14) | 8 | "r" | |
| M_DATA(15) | 8 | "g" | |
| M_DATA(16) | 8 | "a" | |

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| Message 2 (Packet STM-45) : ETCS → STM | | | |
|--|----------|--------------|-------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| M_DATA(17) | 8 | "p" | |
| M_DATA(18) | 8 | " " | |
| M_DATA(19) | 8 | "d" | |
| M_DATA(20) | 8 | "a" | |
| M_DATA(21) | 8 | "t" | |
| M_DATA(22) | 8 | "a" | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |

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| Message 3 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | |
| V_EST | 16 | FINITE VALUE | |
| V_MIN | 16 | FINITE VALUE | |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|----------|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Unchanged | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Unchanged | |
| TIU Direction Controller Position Status | Unchanged | |
| TIU Cab Status | Unchanged | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Unchanged | |



TEST CASE 6i.2

| TEST CASE HEADER | |
|---|---|
| Test Case Identification | Data Available functionality |
| | 6i.2.0.0.0.0 |
| | ETCS airgap data received from RBC |
| ERTMS/ETCS on-board Requirements Tested | Subset-035 : 10.11.1.1, 10.11.1.2, 10.11.1.3 Subset-026 : 3.15.6.5, 7.4.2.11 |
| STM Requirements Tested | Subset-035: None |
| Packets Transmitted via FFFIS STM | STM-8, STM-45 |
| ERTMS/ETCS on-board Configuration | |
| Comments and constraints | Train moving at a constant speed of 100 Km/h |



| Starting Conditions | Value | Comments |
|--|--------------|----------|
| STM State | DA | |
| ETCS Mode | SN | |
| ETCS Level | NTC | |
| Train State | Moving | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | On | |
| TIU Direction Controller Position Status | Forward | |
| TIU Cab Status | Cab A active | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Not isolated | |



ERTMS/ETCS on-board Test Case

| Step | Description/Comments | Input I/F | Input time | Input Action | Output I/F | Output time limit | Output action |
|------|--|-----------|------------|--|------------|-------------------|---|
| - | Initial Condition: Set Position Report Parameters to report the train position at each balise | RTM | | Telegram-R0 | - | | - |
| 1 | The train runs at a constant speed of 100 Km/h | ODO | T0 | Movement at constant speed | PROF | | Message-1 (Packet STM-8) Odometer multicast |
| 2 | A balise group is received | BTM | T0 + 2s | Telegram-B1 Telegram-B2 | RTM | Ts17 | Telegram-R1 (Packet 0 – Position Report) Time: T1 |
| 3 | The train runs at a constant speed of 100 Km/h | ODO | T1 + 0.5s | Movement at constant speed | PROF | | Message-2 (Packet STM-8) Odometer multicast |
| 4 | Airgap data is received from RBC | RTM | T1 + 10s | Telegram-R2 (Packet 44 - Data used by applications outside the ERTMS/ETCS system) | PROF | | Message-3 (STM-45) Check that ESTODO_BG value of Message-3 is between D_EST of Message-1 and D_EST of Message-2 |

STM Test Case

Not applicable



| Telegram R0 : RBC → ETCS | | | |
|--------------------------|----------|--------------|--|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_MESSAGE | 8 | 24 | Message identifier (24: General message) |
| L_MESSAGE | 10 | COMPUTED | Message length |
| T_TRAIN | 32 | FINITE VALUE | Trainborne clock |
| M_ACK | 1 | 0 | Qualifier for acknowledgement request (No acknowledgement required) |
| NID_LRBG | 10 + 14 | FINITE VALUE | Identity of last relevant balise group |
| NID_PACKET | 8 | 58 | Packet identifier (58: Position Report Parameters) |
| Q_DIR | 2 | 10b | Validity direction of transmitted data (Both directions) |
| L_PACKET | 13 | COMPUTED | Packet length |
| Q_SCALE | 2 | FINITE VALUE | Qualifier for the distance scale |
| T_CYCLOC | 8 | FINITE VALUE | Time Interval between two position reports sent by the train |
| D_CYCLOC | 15 | FINITE VALUE | Distance between two position reports from the train |
| M_LOC | 3 | 001b | Special location/moment where the train has to report its position (Every LRBG compliant balise group) |
| N_ITER | 5 | 0 | Number of iterations of a data set following this variable in a packet |
| NID_PACKET | 8 | 255 | Packet identifier (255: End of Information) |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 1 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | |
| V_EST | 16 | FINITE VALUE | |
| V_MIN | 16 | FINITE VALUE | |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Telegram B1 : Balise → ETCS | | | |
|-----------------------------|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| Q_UPDOWN | 1 | 1 | Direction of the information (track to train) |
| M_VERSION | 7 | 010 0000 | Version of the ETCS system (Version 2.0, introduced in SRS 3.3.0) |
| Q_MEDIA | 1 | 0 | Qualifier to indicate the type of media (0: balise) |
| N_PIG | 3 | 0 | Position in Group |
| N_TOTAL | 3 | 1 | Total number of balise(s) in the group |
| M_DUP | 2 | 00b | Duplicate balise (00b: No duplicates) |
| M_MCOUNT | 8 | FINITE VALUE | Message counter |
| NID_C | 10 | FINITE VALUE | Identity number of the country or region |
| NID_BG | 14 | FINITE VALUE | Identity number of the balise group |
| Q_LINK | 1 | 1 | Link Qualifier (Linked) |
| NID_PACKET | 8 | 255 | Packet identifier (255: End of Information) |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Telegram B2 : Balise → ETCS | | | |
|-----------------------------|----------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| Q_UPDOWN | 1 | 1 | Direction of the information (track to train) |
| M_VERSION | 7 | 010 0000 | Version of the ETCS system (Version 2.0, introduced in SRS 3.3.0) |
| Q_MEDIA | 1 | 0 | Qualifier to indicate the type of media (0: balise) |
| N_PIG | 3 | 1 | Position in Group |
| N_TOTAL | 3 | 1 | Total number of balise(s) in the group |
| M_DUP | 2 | 00b | Duplicate balise (00b: No duplicates) |
| M_MCOUNT | 8 | FINITE VALUE | Message counter (same as) |
| NID_C | 10 | FINITE VALUE | Identity number of the country or region (same as Telegram B1) |
| NID_BG | 14 | FINITE VALUE | Identity number of the balise group (same as Telegram B1) |
| Q_LINK | 1 | 1 | Link Qualifier (Linked) |
| NID_PACKET | 8 | 255 | Packet identifier (255: End of Information) |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Telegram R1 : ETCS → RBC | | | |
|--------------------------|----------|-----------------------------------|--|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_MESSAGE | 8 | 136 | Message identifier (136: Train Position Report) |
| L_MESSAGE | 10 | COMPUTED | Message length |
| T_TRAIN | 32 | FINITE VALUE | Trainborne clock |
| NID_ENGINE | 24 | FINITE VALUE | Onboard ETCS identity |
| NID_PACKET | 8 | 0 | Packet identifier (0: Position Report) |
| L_PACKET | 13 | COMPUTED | Packet length |
| Q_SCALE | 2 | 1 | Qualifier for the distance scale (1 m scale) |
| NID_LRBG | 10 + 14 | FINITE VALUE | Identity of last relevant balise group (Corresponding to NID_C + NID_BG values of Telegram B1) |
| D_LRBG | 15 | FINITE VALUE | Distance between the last relevant balise group and the estimated front end of the train |
| Q_DIRLRBG | 2 | 1 | Orientation of the train in relation to the direction of the LRBG (Nominal) |
| Q_DLRBG | 2 | 1 | Qualifier telling on which side of the LRBG the estimated front end is (Nominal) |
| L_DOUBTOVER | 15 | FINITE VALUE | Over-reading amount plus the Q_LOCACC of the LRBG |
| L_DOUBTUNDER | 15 | FINITE VALUE | Under-reading amount plus the Q_LOCACC of the LRBG |
| Q_LENGTH | 2 | 0 | Qualifier for train integrity status |
| V_TRAIN | 7 | FINITE VALUE (between 15 - 25) | Train speed |
| Q_DIRTRAIN | 2 | 1 | Direction of train movement in relation to the LRBG orientation (Nominal) |
| M_MODE | 4 | 13 | Onboard operating mode (National System) |
| M_LEVEL | 3 | 1 | Current Operating Level (Level NTC) |
| NID_NTC | 8 | FINITE VALUE | National System identity (NID_NTC = NID_NTC of the STM in DA) |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 2 (Packet STM-8) : ETCS → STM | | | |
|---------------------------------------|----------|--------------|---------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | 255 | Multicast |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 8 | Packet identifier (STM-8) |
| L_PACKET | 13 | COMPUTED | Packet length |
| T_ODO | 32 | FINITE VALUE | |
| V_MAX | 16 | FINITE VALUE | |
| V_EST | 16 | FINITE VALUE | |
| V_MIN | 16 | FINITE VALUE | |
| D_MAX | 32 | FINITE VALUE | |
| D_EST | 32 | FINITE VALUE | |
| D_MIN | 32 | FINITE VALUE | |
| D_RES | 8 | FINITE VALUE | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Telegram R2 : RBC → ETCS | | | |
|--------------------------|---------|--------------|---|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_MESSAGE | 8 | 24 | Message identifier (24: General message) |
| L_MESSAGE | 10 | COMPUTED | Message length |
| T_TRAIN | 32 | FINITE VALUE | Trainborne clock |
| M_ACK | 1 | 0 | Qualifier for acknowledgement request (No acknowledgement required) |
| NID_LRBG | 10 + 14 | FINITE VALUE | Identity of last relevant balise group (same as Telegram B1) |
| NID_PACKET | 8 | 44 | Packet identifier (44: Data used by applications outside the ERTMS/ETCS system) |
| Q_DIR | 2 | 10b | Validity direction of transmitted data (Both directions) |
| L_PACKET | 13 | COMPUTED | Packet length |
| NID_XUSER | 9 | 102 | Identity of user system (102: National System functions) |
| NID_NTC | 8 | FINITE VALUE | National System identity (NID_NTC =NID_STM of Telegram R1) |
| N_LITER | 8 | 16 | Number of iterations of a data set following |
| M_DATA(1) | 8 | "E" | |
| M_DATA(2) | 8 | "T" | |
| M_DATA(3) | 8 | "C" | |
| M_DATA(4) | 8 | "S" | |
| M_DATA(5) | 8 | " " | |
| M_DATA(6) | 8 | "a" | |
| M_DATA(7) | 8 | "i" | |
| M_DATA(8) | 8 | "r" | |
| M_DATA(9) | 8 | "g" | |
| M_DATA(10) | 8 | "a" | |
| M_DATA(11) | 8 | "p" | |
| M_DATA(12) | 8 | " " | |
| M_DATA(13) | 8 | "d" | |
| M_DATA(14) | 8 | "a" | |

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Telegram R2 : RBC → ETCS

| VARIABLE | Length | VALUE | COMMENTS |
|--------------|----------|--------------|---|
| M_DATA(15) | 8 | "t" | |
| M_DATA(16) | 8 | "a" | |
| NID_PACKET | 8 | 255 | Packet identifier (255: End of Information) |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| Message 3 (Packet STM-45) : ETCS → STM | | | |
|--|--------|--------------|--|
| VARIABLE | Length | VALUE | COMMENTS |
| NID_STM | 8 | FINITE VALUE | The NID_STM which the ERTMS/ETCS on-board is connected to (NID_STM = NID_NTC of Telegram R1) |
| L_MESSAGE | 8 | COMPUTED | Message length |
| NID_PACKET | 8 | 45 | Packet identifier (STM-45) |
| L_PACKET | 13 | COMPUTED | Packet length |
| D_ESTODO_BG | 32 | FINITE VALUE | Odometer reading of the LRBG of Telegram R1 |
| N_LITER | 8 | 21 | Number of iterations of a data set following |
| M_DATA(1) | 8 | 44 | NID_PACKET of Telegram R1 |
| M_DATA(2) | 8 | FINITE VALUE | Q_DIR (2 bits) + part of L_PACKET (6 bits) of Telegram R1 |
| M_DATA(3) | 8 | FINITE VALUE | part of L_PACKET (7 bits) + part of NID_XUSER (1 bit) of Telegram R1 |
| M_DATA(4) | 8 | FINITE VALUE | part of NID_XUSER (8 bits) of Telegram R1 |
| M_DATA(5) | 8 | FINITE VALUE | NID_NTC of Telegram R1 |
| M_DATA(6) | 8 | 16 | N_LITER of Telegram R1 |
| M_DATA(7) | 8 | "E" | |
| M_DATA(8) | 8 | "T" | |
| M_DATA(9) | 8 | "C" | |
| M_DATA(10) | 8 | "S" | |
| M_DATA(11) | 8 | " " | |
| M_DATA(12) | 8 | "a" | |
| M_DATA(13) | 8 | "I" | |
| M_DATA(14) | 8 | "r" | |
| M_DATA(15) | 8 | "g" | |
| M_DATA(16) | 8 | "a" | |

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| Message 3 (Packet STM-45) : ETCS → STM | | | |
|--|----------|--------------|-------------------------|
| VARIABLE | Length | VALUE | COMMENTS |
| M_DATA(17) | 8 | "p" | |
| M_DATA(18) | 8 | " " | |
| M_DATA(19) | 8 | "d" | |
| M_DATA(20) | 8 | "a" | |
| M_DATA(21) | 8 | "t" | |
| M_DATA(22) | 8 | "a" | |
| PADDING BITS | COMPUTED | NOT RELEVANT | Value not to be checked |



| End Conditions | Value | Comments |
|--|--------------|----------|
| STM State | Unchanged | |
| ETCS Mode | Unchanged | |
| ETCS Level | Unchanged | |
| Train State | Not Relevant | |
| ETCS Train Data | Not Relevant | |
| Active DMI channel Connection | Not Relevant | |
| Other DMI channels Connections | Not Relevant | |
| TIU Connection | Not Relevant | |
| BIU Connection | Not Relevant | |
| JD Connection | Not Relevant | |
| TIU Regenerative Brake Command | Not Relevant | |
| TIU Magnetic Shoes Brake Command | Not Relevant | |
| TIU Eddy Current Brake Command for Emergency Brake | Not Relevant | |
| TIU Eddy Current Brake Command for Service Brake | Not Relevant | |
| TIU Pantograph Command | Not Relevant | |
| TIU Air Tightness Command | Not Relevant | |
| TIU Main Switch / Circuit Breaker Command | Not Relevant | |
| TIU Traction Cut Off Command | Not Relevant | |
| TIU Traction Status | Not Relevant | |
| TIU Direction Controller Position Status | Not Relevant | |
| TIU Cab Status | Not Relevant | |
| BIU Emergency Brake Command | Not Relevant | |
| BIU Service Brake Command | Not Relevant | |
| BIU Emergency Brake Status | Not Relevant | |
| BIU Service Brake Status | Not Relevant | |
| NTC isolation status | Unchanged | |