

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Electronic railway equipment – Train communication network (TCN) –
Part 2-8: TCN conformance test**

**Matériel électronique ferroviaire – Réseau embarqué de train (TCN) –
Partie 2-8: Essai de conformité TCN**

[IEC 61375-2-8:2021](https://standards.iteh.ai/catalog/standards/iec/92da4ffd-6463-4cd3-a28c-e6dc5324f34b/iec-61375-2-8-2021)

<https://standards.iteh.ai/catalog/standards/iec/92da4ffd-6463-4cd3-a28c-e6dc5324f34b/iec-61375-2-8-2021>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Electronic railway equipment – Train communication network (TCN) –
Part 2-8: TCN conformance test**

**Matériel électronique ferroviaire – Réseau embarqué de train (TCN) –
Partie 2-8: Essai de conformité TCN**

[IEC 61375-2-8:2021](https://standards.iteh.ai/catalog/standards/iec/92da4ffd-6463-4cd3-a28c-e6dc5324f34b/iec-61375-2-8-2021)

<https://standards.iteh.ai/catalog/standards/iec/92da4ffd-6463-4cd3-a28c-e6dc5324f34b/iec-61375-2-8-2021>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 45.060.01

ISBN 978-2-8322-7440-8

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	14
INTRODUCTION.....	16
1 Scope.....	17
2 Normative references	17
3 Terms, definitions, symbols and abbreviated terms.....	19
3.1 Terms and definitions.....	19
3.2 Symbols and abbreviated terms	19
4 Conformance test: approach, requirements and boundaries.....	20
4.1 Approach	20
4.1.1 General	20
4.1.2 Requirements	20
4.1.3 Requirements declaration statements for an Item Under Test (IUT)	22
4.2 Boundaries	23
4.2.1 General	23
4.2.2 Basic interconnection tests	24
4.2.3 Capability tests	24
4.2.4 Behaviour tests.....	25
4.2.5 Conformance resolution tests	25
4.2.6 Interpretation of clauses/subclauses and statements	26
4.2.7 Relation to interoperability	27
4.2.8 Relation to performance test.....	28
4.2.9 Definition of test cases	28
4.3 Conformance assessment process outline	29
4.3.1 General	29
4.3.2 Analysis of results, outcomes and verdicts.....	29
4.4 Mapping of IUT types to conformance test suites	30
5 Basic interface test.....	31
5.1 Scope	31
5.2 PICS pro-forma.....	31
5.2.1 General	31
5.2.2 PICS Tables	31
5.3 Testing framework	33
5.4 Physical layer test.....	33
5.4.1 Test purpose	33
5.4.2 Inspection of the Hardware Ethernet interface	33
5.4.3 Inspection of the mechanical Ethernet interface construction	33
5.4.4 Check of electrical Ethernet interface design	34
5.4.5 Check of Ethernet interface characteristics	34
5.4.6 Ethernet signal wave form test (IEEE standard)	34
5.4.7 Ethernet signal wave form test (amplified signals, optional)	34
5.4.8 Auto-Crossover- and Auto-Sensing-Test (only for switches).....	34
5.5 Basic communication protocol test.....	35
5.5.1 Test purpose	35
5.5.2 Simple communication test.....	35
5.5.3 UDP rising payload test (only for End Devices).....	35
5.5.4 TCP rising payload test (only for End Devices)	35

5.5.5	UDP long term test (only for End Devices).....	35
5.6	Communication reliability tests.....	35
5.6.1	Test purpose	35
5.6.2	Burst immunity test.....	35
5.6.3	Ethernet interface isolation test	36
6	Conformance test of End Device.....	36
6.1	General.....	36
6.2	Related requirements.....	37
6.3	IUT and Test scope.....	37
6.4	PICS Pro-forma	38
6.4.1	General	38
6.4.2	PICS Tables	38
6.5	Testing framework	44
6.6	Test Suite IEC 61375-2-3.....	46
6.6.1	Test case TCCT23ED_001	46
6.6.2	Test case TCCT23ED_002	47
6.6.3	Test case TCCT23ED_003	49
6.6.4	Test case TCCT23ED_004	50
6.6.5	Test case TCCT23ED_005	51
6.6.6	Test case TCCT23ED_006	52
6.6.7	Test case TCCT23ED_007	53
6.6.8	Test case TCCT23ED_008	54
6.6.9	Test case TCCT23ED_009	55
6.7	Test Suite IEC 61375-2-5.....	55
6.7.1	Test case TCCT25ED_001	55
6.7.2	Test case TCCT25ED_002	56
6.7.3	Test case TCCT25ED_003	57
6.7.4	Test case TCCT25ED_004	58
6.7.5	Test case TCCT25ED_005	59
6.7.6	Test case TCCT25ED_006	60
6.7.7	Test case TCCT25ED_007	61
6.7.8	Test case TCCT25ED_008	62
6.7.9	Test case TCCT25ED_009	63
6.7.10	Test case TCCT25ED_010	64
6.8	Test Suite IEC61375-3-4.....	65
6.8.1	Test case TCCT34ED_001	65
6.8.2	Test case TCCT34ED_002	66
6.8.3	Test case TCCT34ED_003	67
6.8.4	Test case TCCT34ED_004	68
6.8.5	Test case TCCT34ED_005	69
6.8.6	Test case TCCT34ED_006	70
6.8.7	Test case TCCT34ED_007	71
6.8.8	Test case TCCT34ED_008	72
6.8.9	Test case TCCT34ED_009	73
6.8.10	Test case TCCT34ED_010	74
6.8.11	Test case TCCT34ED_011	75
6.8.12	Test case TCCT34ED_012	76
6.8.13	Test case TCCT34ED_013	77
6.8.14	Test case TCCT34ED_014	78

6.8.15	Test case TCCT34ED_015	79
6.8.16	Test case TCCT34ED_016	80
6.8.17	Test case TCCT34ED_017	81
6.8.18	Test case TCCT34ED_018	82
6.8.19	Test case TCCT34ED_019	83
6.8.20	Test case TCCT34ED_020	84
6.8.21	Test case TCCT34ED_021	85
6.8.22	Test case TCCT34ED_022	86
7	Conformance test of ECN-equipped consist	86
7.1	Scope	86
7.2	Related requirements	86
7.3	PICS Pro-forma	86
7.3.1	General	86
7.3.2	PICS tables	87
7.4	Test cases	93
7.4.1	General	93
7.4.2	Recovery in case of network failure	94
7.4.3	IP address assignment via DHCP	96
7.4.4	Name (TCN-URI address) resolution via DNS	97
7.4.5	Switch basic functions	98
7.4.6	Priority levels	99
7.4.7	Ingress rate limiting	99
7.4.8	Egress rate shaping	100
7.4.9	Untagged/tagged frames	100
7.4.10	Switching and routing performance (optional)	101
7.4.11	NTP support	102
7.4.12	Switch management	102
7.4.13	Network management via SNMP	103
7.4.14	ECSP Interface (optional)	104
7.4.15	TTDB manager interface (optional)	105
7.4.16	DNS TCN interface (optional)	105
7.4.17	ETBN control interface (optional)	106
8	Conformance test of ETBN	106
8.1	Test scope	106
8.1.1	General	106
8.1.2	References	106
8.2	PICS Pro-forma	107
8.2.1	General	107
8.2.2	PICS tables	107
8.3	Test cases	115
8.3.1	Testing framework	115
8.3.2	Common Consist Topologies	118
8.3.3	Test Suite: ETB port settings	121
8.3.4	Test Suite: ETB Line Status and Link Aggregation management	123
8.3.5	Test Suite: TTDP HELLO format and content	130
8.3.6	Test Suite: Unicast address assignment and unicast routing	134
8.3.7	Test Suite: IP Multicast forwarding	137
8.3.8	Test Suite: TOPOLOGY frame format and basic functionality	148
8.3.9	Test Suite: Physical topology management and calculation	152

8.3.10	Test Suite: Logical connectivity management and calculation	156
8.3.11	Test Suite: Failing/loss of node(s).....	162
8.3.12	Test Suite: Late/recovered node(s)	166
9	Conformance test of TRDP	172
9.1	General.....	172
9.2	Related requirements.....	173
9.3	SUT and Test scope	173
9.4	PICS Pro-forma	173
9.4.1	General	173
9.4.2	PICS Tables	173
9.5	Message Data test.....	187
9.5.1	Testing framework	187
9.5.2	Communication Model Test.....	188
9.5.3	Communication Pattern and Addressing Test.....	192
9.5.4	MD-PDU Test	204
9.5.5	TRDP Layer Service Primitives Test	206
9.5.6	TRDP Layer Filtering Rules Test.....	209
9.5.7	Caller TRDP Layer Test.....	214
9.5.8	Replier TRDP Layer Test.....	234
9.5.9	TCP Connection Handling Test.....	249
9.5.10	Message Data Echo Server Test.....	257
9.6	Process Data test	258
9.6.1	General	258
9.6.2	Test setup	258
9.6.3	PD push pattern test cases.....	259
9.6.4	PD pull pattern test cases.....	280
10	SDTv2 Conformance Test.....	298
10.1	Scope	298
10.1.1	General	298
10.1.2	Related requirements	298
10.1.3	Terms and abbreviations	298
10.1.4	Test scope.....	298
10.2	PICS Pro-forma	299
10.2.1	General	299
10.2.2	PICS Tables	299
10.3	SDSRC- SAFE DATA SOURCE	302
10.3.1	Purpose.....	302
10.3.2	Inspection of the SID Structure	302
10.3.3	Inspection of the Vital Data Packet	303
10.3.4	Exclusivity	304
10.3.5	SDSRC performance	305
10.4	SDSINK – SAFE DATA SINK	305
10.4.1	General	305
10.4.2	VDP sampling.....	305
10.4.3	VDP Integrity Check	305
10.4.4	Sink Time Supervision	306
10.4.5	Guard Time Supervision	306
10.4.6	Latency Monitoring	306
10.4.7	Channel Monitoring.....	307

10.4.8	SDTv2 Application Interface	307
10.4.9	Diagnostics and statistics	308
11	Conformance test of ETB-equipped consist	308
11.1	Scope	308
11.2	Abstract consist tester architecture	309
11.3	Consist test stages	311
11.4	PICS Pro-forma	311
11.4.1	General	311
11.4.2	PICS Tables	311
11.5	Related requirements.....	314
11.6	Testing configurations.....	314
11.6.1	General	314
11.6.2	Testing configuration TC1.....	315
11.6.3	Testing configuration TC2.....	316
11.6.4	Testing configuration TC3.....	316
11.7	Consist tester operation	317
11.7.1	General	317
11.7.2	ECS addressing.....	317
11.7.3	Test Stimuli	317
11.7.4	Expected result verification.....	320
11.7.5	Test execution timing considerations	321
11.8	Basic test.....	321
11.8.1	General	321
11.8.2	Test sequence for TTDB computation (middle consist, same orientation).....	321
11.8.3	Test sequence for TTDB computation (middle consist, inverse orientation)	321
11.8.4	Test sequence for TTDB computation (end consist, no traction, same orientation)	322
11.8.5	Test sequence for TTDB computation (end consist, no traction, inverse orientation)	322
11.8.6	Test sequence for TTDB computation (end consist, traction, same orientation)	323
11.8.7	Test sequence for TTDB computation (end consist, traction, inverse orientation)	323
11.8.8	Test sequence for TTDB computation (train lengthening and shortening).....	324
11.9	Leading test.....	325
11.9.1	General	325
11.9.2	Test sequence for Leading (TE1.1 leading, CuT middle).....	326
11.9.3	Test sequence for Leading (TE2 leading, CuT middle).....	326
11.9.4	Test sequence for Leading (TE1.1 leading, CuT end)	326
11.9.5	Test sequence for Leading (CuT leading direction 1)	327
11.9.6	Test sequence for Leading (CuT leading direction 2)	327
11.9.7	Test sequence for Leading (Leading double request).....	328
11.9.8	Test sequence for Leading (Leading conflict).....	329
11.10	Inhibit test.....	329
11.10.1	General	329
11.10.2	Test sequence for Inhibit (single).....	329
11.10.3	Test sequence for Inhibit (multiple).....	330
11.11	Confirmation/correction test	331
11.11.1	General	331

11.11.2	Test sequence for confirmation	332
11.11.3	Test sequence for correction single middle vehicle	333
11.11.4	Test sequence for correction two middle vehicles	333
11.11.5	Test sequence for correcting three middle vehicles	334
11.11.6	Test sequence for correcting end vehicle	335
11.12	Sleep mode function (optional)	336
11.12.1	General	336
11.12.2	Test sequence for sleep mode	336
11.13	Performance test	337
11.13.1	General	337
11.13.2	Inauguration performance	337
11.13.3	ECSP performance	338
11.14	End-to-End Communication	339
11.15	Multiple ETB test (option)	339
11.15.1	General	339
11.15.2	Conformance test	340
Annex A (normative)	Test laboratory role and client role	341
A.1	Test laboratory and client role	341
A.1.1	General	341
A.1.2	Overview	341
A.2	Preparation for testing	342
A.2.1	General	342
A.2.2	General administrative steps	342
A.2.3	Agreement on test methods and selection of test suites	342
A.2.4	Exchange of documentation for conformance assessment	343
A.3	Test operation	344
A.3.1	General	344
A.3.2	Static conformance review	344
A.3.3	Selection of test cases and test parameterisation	345
A.3.4	Test campaign	345
A.4	Production of test reports	346
A.4.1	General	346
A.4.2	IUT conformance test report	347
A.4.3	Protocol conformance test report	347
Annex B (informative)	Instructions for filling the PICS pro-forma	349
B.1	General	349
B.2	Abbreviations	349
B.3	Reference column	349
B.4	Supported subclause column	350
B.5	Supported capability column	350
B.6	Requirement column	350
B.7	Implementation column	350
B.8	Parameter values columns	351
B.8.1	Allowed min.	351
B.8.2	Default value	351
B.8.3	Allowed max.	351
B.8.4	Implemented value	351
Annex C (informative)	Test instrumentation and dedicated test bed	352
C.1	Test instrumentation	352

C.1.1	Standard instrumentation – Test suites standard instrumentation.....	352
C.1.2	Test bed architecture	352
C.1.3	Consist tester specification	353
	Bibliography.....	356
Figure 1	– Setup for burst immunity test.....	36
Figure 2	– End Device conformance testing process	37
Figure 3	– Consist topology and logical view of ECN.....	38
Figure 4	– Testing framework architecture	44
Figure 5	– General configuration for ECN-equipped consist test	94
Figure 6	– Example of configuration for the test of network redundancy	94
Figure 7	– Example of configuration of network redundancy with dual homing End Device interfaces	95
Figure 8	– Example of the configuration for the test of IP address assignment via DHCP	97
Figure 9	– Example of the configuration for the test of Name resolution via DNS	98
Figure 10	– Example of the configuration for the test of NTP support.....	102
Figure 11	– Example of the configuration for the test of Network management via SNMP	104
Figure 12	– TTS1 One ETBN connects with test system (monitoring).....	116
Figure 13	– TTS2 single ETBN connects with test system (one side simulation).....	116
Figure 14	– TTS3 Single ETBN connects with test system (both sides simulation)	117
Figure 15	– TTS4 Multiple ETBNs connect with test system (monitoring)	117
Figure 16	– TTS5 multiple ETBNs connect with test system (one side simulation).....	118
Figure 17	– TTS6 Multiple ETBN connects with test system (both sides simulation).....	118
Figure 18	– Consist topology with single ETBN and single CN	119
Figure 19	– Consist topology with multiple ETBNs, each connected to a separate CN.....	119
Figure 20	– Consist topology with a single ETBN connected to multiple CNs	119
Figure 21	– Consist topology with single CN with redundant ETBNs	120
Figure 22	– Consist topology with multiple CNs with redundant ETBNs.....	120
Figure 23	– Consist topology with multiple ETNs and CNs connected asymmetrically	120
Figure 24	– Setup to verify full duplex mode on ETB ports	122
Figure 25	– Example where IUT sends TOPOLOGY on line B (here X is B, Y is A)	124
Figure 26	– Simulating Logical line down for single line setup, by letting simulator stop sending HELLO on line X (line A).....	125
Figure 27	– Simulating Logical line down for multiple line setup, by letting simulator stop sending HELLO on line X (here line B)	125
Figure 28	– Simulating one-way transmission error, by letting simulator send HELLO with recvXStatus FALSE (here recvBStatus FALSE)	126
Figure 29	– Testing correct handling of loss of HELLO transmitted by IUT, and loss of HELLO sent to IUT.....	127
Figure 30	– ETB line failover setup, the line where IUT initially forwards the data stream is referred to as 'X' (here line B).....	128
Figure 31	– Topology for general multicast routing tests	138
Figure 32	– Topology for testing multicast with ETBN with multiple CNs	140
Figure 33	– Multicast test setup for consist with ECNs connected to different ETBNs.....	141

Figure 34 – Testing multicast with redundant ETBNs and single CN	142
Figure 35 – Multicast routing in consist with redundant ETBN and multiple CNs.....	144
Figure 36 – Testing multicast handling after reinauguation.....	145
Figure 37 – Test of multicast between local CNs on same ETBN when inaugurating	146
Figure 38 – Test of multicast between local CNs on different ETBNs when inaugurating	147
Figure 39 – Test ability to translate multicast destination address	147
Figure 40 – Testing transmission of connectivity vector	154
Figure 41 – Testing transmission of ETBN Vectors, number of ETBNs and ConnTableCrc32.....	155
Figure 42 – Testing loss of intermediate ETBNs/consists when inauguration is inhibited	162
Figure 43 – Test of losing intermediate ETBN in existence of "unknown intermediate"	163
Figure 44 – Test ability to handle loss of end node	164
Figure 45 – Test ability to handle loss of end node during lengthening.....	165
Figure 46 – Test ability to handle loss of end node when “late intermediate” is present.....	166
Figure 47 – Test environment	172
Figure 48 – System under Test.....	173
Figure 49 – TTS, IUT connected to the test system.....	259
Figure 50 – The switch in test topology	259
Figure 51 – TRDP telegram format.....	260
Figure 52 – Dataset of CONFTEST_PUSH_FORMAT	261
Figure 53 – Dataset of CONFTEST_UDP_PORT.....	262
Figure 54 – Dataset of CONFTEST_FCS	264
Figure 55 – Dataset of CONFTEST_FCS_REPLY	264
Figure 56 – Dataset of CONFTEST_PROTO_VERSION.....	266
Figure 57 – Dataset of CONFTEST_PROTO_VERSION_REPLY.....	266
Figure 58 – Dataset of CONFTEST_SIMU_TOPO	269
Figure 59 – Dataset of CONFTEST_IDU_TOPO.....	269
Figure 60 – Dataset of CONFTEST_DATA_LEN_1432	271
Figure 61 – Dataset of CONFTEST_DATA_LEN_0.....	271
Figure 62 – Dataset of CONFTEST_DATA_LEN_512.....	271
Figure 63 – Byte alignment test of 441 bytes length telegram data.....	273
Figure 64 – Byte alignment test of 442 bytes length telegram data.....	273
Figure 65 – Byte alignment test of 443 bytes length telegram data.....	273
Figure 66 – Dataset of CONFTEST_PUSH_FORMAT	275
Figure 67 – Dataset of CONFTEST_TIMEOUT_BEHAVIOR_ZERO	275
Figure 68 – Dataset of CONFTEST_TIMEOUT_BEHAVIOR_KEEP	276
Figure 69 – Dataset of CONFTEST_IP_FILTER	277
Figure 70 – Dataset of CONFTEST_IP_FILTER_REPLY	277
Figure 71 – DSCP(QOS) and TTL test telegram data	278
Figure 72 – Dataset of CONFTEST_REDUNDANT.....	279
Figure 73 – Dataset of CONFTEST_UNICAST	280
Figure 74 – Dataset of CONFTEST_PULL_FORMAT_REQUEST	282
Figure 75 – Dataset of CONFTEST_PULL_FORMAT_REPLY	283

Figure 76 – Dataset of CONFTEST_FCS_REQUEST	284
Figure 77 – Dataset of CONFTEST_FCS_REPLY	284
Figure 78 – Dataset of CONFTEST_PROTO_VERSION_REQUEST	286
Figure 79 – Dataset of CONFTEST_PROTO_VERSION_REPLY	286
Figure 80 – Dataset of CONFTEST_SIMU_TOPO	288
Figure 81 – Dataset of CONFTEST_IUT_TOPO	289
Figure 82 – Dataset of CONFTEST_IP_FILTER	290
Figure 83 – Dataset of CONFTEST_IP_FILTER_REPLY	290
Figure 84 – Dataset of CONFTEST_TIMEOUT_REQUEST_ZERO	292
Figure 85 – Dataset of CONFTEST_TIMEOUT_REPLY_ZERO	293
Figure 86 – Dataset of CONFTEST_TIMEOUT_REQUEST_KEEP	293
Figure 87 – Dataset of CONFTEST_TIMEOUT_REPLY_KEEP	294
Figure 88 – Dataset of CONFTEST_PULL_UNICAST	295
Figure 89 – Dataset of CONFTEST_REPLY_COMID_REQUEST	296
Figure 90 – Dataset of CONFTEST_REPLY_COMID_REPLY	296
Figure 91 – Dataset of CONFTEST_REPLY_IPADDRESS_REQUEST	297
Figure 92 – Dataset of CONFTEST_REPLY_IPADDRESS_REPLY	297
Figure 93 – SDTV2 conformance testing process	298
Figure 94 – SID Generation	302
Figure 95 – Structure of a VDP	303
Figure 96 – VDP with detailed trailer structure	304
Figure 97 – Consist tester architecture	309
Figure 98 – ECSP proxy	310
Figure 99 – Testing configuration variants	315
Figure 100 – Testing configuration TC1	316
Figure 101 – Testing configuration TC2	316
Figure 102 – Testing configuration TC3	316
Figure 103 – TRDP ECSP control telegram	318
Figure C.1 – Coach tester architecture	353
Figure C.2 – Complete consist tester architecture	354
Figure C.3 – Multiple ETB tester architecture	355
Table 1 – Relation to interoperability	28
Table 2 – Relation to performance test	28
Table 3 – Test case categories	29
Table 4 – Mapping conformance testing suites to IUT types	31
Table 5 – Testing framework DEVICE description	45
Table 6 – Test case TCCT23ED_001	46
Table 7 – Test case TCCT23ED_002	47
Table 8 – Test case TCCT23ED_003	49
Table 9 – Test case TCCT23ED_004	50
Table 10 – Test case TCCT23ED_005	51
Table 11 – Test case TCCT23ED_006	52

Table 12 – Test case TCCT23ED_007	53
Table 13 – Test case TCCT23ED_008	54
Table 14 – Test case TCCT23ED_009	55
Table 15 – Test case TCCT25ED_001	55
Table 16 – Test case TCCT25ED_002	56
Table 17 – Test case TCCT25ED_003	57
Table 18 – Test case TCCT25ED_004	58
Table 19 – Test case TCCT25ED_005	59
Table 20 – Test case TCCT25ED_006	60
Table 21 – Test case TCCT25ED_007	61
Table 22 – Test case TCCT25ED_008	62
Table 23 – Test case TCCT25ED_009	63
Table 24 – Test case TCCT25ED_010	64
Table 25 – Test case TCCT34ED_001	65
Table 26 – Test case TCCT34ED_002	66
Table 27 – Test case TCCT34ED_003	67
Table 28 – Test case TCCT34ED_004	68
Table 29 – Test case TCCT34ED_005	69
Table 30 – Test case TCCT34ED_006	70
Table 31 – Test case TCCT34ED_007	71
Table 32 – Test case TCCT34ED_008	72
Table 33 – Test case TCCT34ED_009	73
Table 34 – Test case TCCT34ED_010	74
Table 35 – Test case TCCT34ED_011	75
Table 36 – Test case TCCT34ED_012	76
Table 37 – Test case TCCT34ED_013	77
Table 38 – Test case TCCT34ED_014	78
Table 39 – Test case TCCT34ED_015	79
Table 40 – Test case TCCT34ED_016	80
Table 41 – Test case TCCT34ED_017	81
Table 42 – Test case TCCT34ED_018	82
Table 43 – Test case TCCT34ED_019	83
Table 44 – Test case TCCT34ED_020	84
Table 45 – Test case TCCT34ED_021	85
Table 46 – Test case TCCT34ED_022	86
Table 47 – Push pattern telegram test	259
Table 48 – Push pattern telegram format content	260
Table 49 – Telegram parameter of push pattern test	261
Table 50 – Destination UDP port test	262
Table 51 – Destination UDP port test telegram parameter	262
Table 52 – FCS check test	263
Table 53 – FCS check test telegram parameter	263
Table 54 – FCS check test reply telegram parameter	263

Table 55 – Protocol version test.....	265
Table 56 – Protocol version test telegram parameter	265
Table 57 – Protocol version test reply telegram parameter.....	265
Table 58 – Topology counter test.....	267
Table 59 – Simulator sending telegram parameter	268
Table 60 – IUT sending telegram parameter	269
Table 61 – Data length test.....	270
Table 62 – Data length test of 1 432 bytes length telegram parameters	270
Table 63 – Data length test of 0 byte length telegram parameters	270
Table 64 – Data length test of 512 bytes length telegram parameters	270
Table 65 – Byte alignment test.....	272
Table 66 – Byte alignment test of 441 bytes length telegram parameters	272
Table 67 – Byte alignment test of 442 bytes length telegram parameters	272
Table 68 – Byte alignment test of 443 bytes length telegram parameters	272
Table 69 – Timeout and validity test.....	274
Table 70 – Timeout and validity test telegram parameters.....	274
Table 71 – Timeout and validity test reply telegram parameters(ZERO mode).....	274
Table 72 – Timeout and validity test reply telegram parameters(KEEP mode).....	275
Table 73 – Receiving port IP filtering test.....	276
Table 74 – Receiving port IP filtering test telegram parameters.....	276
Table 75 – Receiving port IP filtering test reply telegram parameters	277
Table 76 – DSCP(QOS) and TTL test.....	278
Table 77 – DSCP(QOS) and TTL test telegram parameters.....	278
Table 78 – Redundancy test	279
Table 79 – Redundancy test telegram parameter	279
Table 80 – point to point test of push pattern	280
Table 81 – point to point test telegram parameter	280
Table 82 – Pull pattern telegram test	281
Table 83 – Pull pattern request telegram format content	281
Table 84 – Pull pattern reply telegram format content	281
Table 85 – Request telegram parameter of pull pattern test	282
Table 86 – Reply telegram parameter of pull pattern test	282
Table 87 – FCS check test.....	283
Table 88 – FCS check test request parameter	283
Table 89 – FCS check test reply parameter	284
Table 90 – Protocol version test.....	285
Table 91 – Protocol version test request telegram parameter	285
Table 92 – Protocol version test reply telegram parameter.....	285
Table 93 – Topology counter test.....	287
Table 94 – Requester topology counter test telegram parameter.....	288
Table 95 – Receiving port IP filtering test.....	289
Table 96 – Receiving port IP filtering test telegram parameters.....	289
Table 97 – Receiving port IP filtering test reply telegram parameters	290
Table 98 – Timeout and validity test.....	291
Table 99 – Timeout and validity test request telegram parameters (ZERO mode).....	291
Table 100 – Timeout and validity test reply telegram parameters (ZERO mode).....	291