

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Industrial communication networks – Fieldbus specifications –  
Part 5-10: Application layer service definition – Type 10 elements**

**Réseaux de communication industriels – Spécifications des bus de terrain –  
Partie 5-10: Définition des services de la couche application – Éléments de  
type 10**



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2023 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](mailto:info@iec.ch)  
[www.iec.ch](http://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](http://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 It also gives information on projects, replaced and withdrawn publications.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](http://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](http://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](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://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](http://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](http://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](http://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](http://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](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://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](http://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



---

**Industrial communication networks – Fieldbus specifications –  
Part 5-10: Application layer service definition – Type 10 elements**

**Réseaux de communication industriels – Spécifications des bus de terrain –  
Partie 5-10: Définition des services de la couche application – Éléments de  
type 10**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 25.040.40, 35.100.70, 35.110

ISBN 978-2-8322-7871-0

**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.....	17
INTRODUCTION.....	19
1 Scope.....	20
1.1 General.....	20
1.2 Specifications .....	21
1.3 Conformance .....	21
2 Normative references .....	21
3 Terms, definitions, abbreviated terms, symbols and conventions .....	24
3.1 Referenced terms and definitions.....	24
3.1.1 ISO/IEC 7498-1 terms.....	24
3.1.2 ISO/IEC 8822 terms.....	25
3.1.3 ISO/IEC 9545 terms.....	25
3.1.4 ISO/IEC 8824-1 terms.....	25
3.2 Additional Type 10 terms and definitions.....	25
3.3 Additional Type 10 terms and definitions for media redundancy .....	33
3.4 Abbreviations and symbols .....	34
3.4.1 General .....	34
3.4.2 Additional Type 10 abbreviations and symbols.....	37
3.4.3 Abbreviations and symbols for services .....	40
3.4.4 Void.....	40
3.5 Conventions.....	40
3.5.1 Overview .....	40
3.5.2 General conventions.....	41
3.5.3 Conventions for class definitions .....	41
3.5.4 Conventions for service definitions .....	42
3.5.5 Conventions used in state machines.....	43
4 Concepts .....	43
5 Data type ASE.....	44
5.1 General.....	44
5.1.1 Overview .....	44
5.1.2 Date and time type specifics .....	44
5.1.3 Transfer of user data .....	44
5.1.4 Data type overview .....	44
5.2 Formal definition of data type objects.....	47
5.2.1 Data type class.....	47
5.3 FAL defined data types .....	49
5.3.1 Fixed length types .....	49
5.3.2 Variable Length types .....	71
5.4 Data type ASE service specification.....	74
6 Communication model for common services .....	74
6.1 Concepts .....	74
6.1.1 General .....	74
6.1.2 Structure of an end station.....	75
6.1.3 Structure of a bridged end station .....	76
6.1.4 Structure of a bridge .....	77
6.1.5 Examples of stations .....	78

6.1.6	Automation system .....	79
6.2	ASE data types .....	80
6.3	ASEs .....	80
6.3.1	Middle Layer ASEs .....	80
6.3.2	Remote procedure call ASE .....	81
6.3.3	Remote service interface ASE .....	90
6.3.4	Domain name system ASE .....	103
6.3.5	Simple network management ASE .....	104
6.3.6	NETCONF ASE .....	107
6.3.7	NETCONF event ASE .....	108
6.3.8	IP suite ASE .....	109
6.3.9	Real time cyclic ASE .....	113
6.3.10	Real time acyclic ASE .....	130
6.3.11	Discovery and basic configuration ASE .....	140
6.3.12	Dynamic host configuration ASE .....	173
6.3.13	IEEE Std 802.1AB ASE .....	175
6.3.14	Media redundancy ASE .....	189
6.3.15	Precision time control ASE .....	196
6.3.16	IEEE Std 802.1AS ASE .....	210
6.3.17	IEEE Std 802.1Q ASE .....	214
6.3.18	IEEE Std 802.1CB ASE .....	230
6.3.19	Fragmentation ASE .....	236
6.3.20	IEEE Std 802.3 ASE .....	238
6.3.21	Void .....	241
6.3.22	Common DL mapping ASE .....	241
6.4	Additional information .....	248
7	Communication model for distributed I/O .....	248
7.1	Concepts .....	248
7.1.1	User requirements .....	248
7.1.2	Features .....	248
7.1.3	Associations .....	249
7.1.4	Device types .....	250
7.1.5	Instance model and device addresses .....	260
7.1.6	Application process .....	260
7.1.7	Application service element .....	268
7.1.8	Application relationship .....	270
7.2	ASE data types .....	270
7.3	ASEs .....	271
7.3.1	AR ASE .....	271
7.3.2	Real Identification ASE .....	409
7.3.3	CIM ASE .....	502
7.3.4	Diagnosis ASE .....	604
7.3.5	PE ASE .....	652
7.3.6	LogBook ASE .....	662
7.3.7	RS ASE .....	665
7.3.8	Time ASE .....	690
7.3.9	NME ASE .....	695
7.4	Application characteristics .....	734
7.4.1	Device Ident Number .....	734

7.4.2	Network topology .....	735
7.5	Summary of FAL services .....	736
7.5.1	IO device .....	736
7.5.2	IO controller .....	737
7.5.3	IO supervisor .....	738
Annex A (informative)	Device instances .....	739
Annex B (informative)	Components of an Ethernet interface .....	741
Annex C (informative)	Scheme of MAC address assignment .....	745
Annex D (informative)	Measurement of the fast startup time .....	746
Annex E (informative)	Dynamic Frame Packing .....	747
Annex F (informative)	Precondition for Diagnosis .....	755
Bibliography	.....	761
Figure 1	– Structure of an automation station .....	74
Figure 2	– Overall view of communication ASEs .....	75
Figure 3	– Structure of an end station .....	76
Figure 4	– Structure of a bridged end station .....	77
Figure 5	– IEEE Std 802 station example 1 (end station and bridge configuration portion) .....	78
Figure 6	– IEEE Std 802 station example 3 .....	79
Figure 7	– IEEE Std 802 station example 4 .....	79
Figure 8	– Automation system example .....	80
Figure 9	– Middle Layer ASEs communication architecture .....	80
Figure 10	– Sequence Chart for reading the EndPointMapper .....	83
Figure 11	– Media redundancy diagnosis dependencies .....	195
Figure 12	– PTCP applications .....	196
Figure 13	– Example of periods at a local port .....	227
Figure 14	– Example of communication between controlling devices and field devices .....	249
Figure 15	– Example of communication between an engineering station and several controlling and field devices .....	250
Figure 16	– Example of communication between field devices and a server station .....	250
Figure 17	– Example of communication between field devices .....	250
Figure 18	– Interfaces, components and ports .....	251
Figure 19	– Multiple interfaces, components and ports .....	252
Figure 20	– Multiple interfaces, one bridge component with one external port .....	253
Figure 21	– Multiple interfaces, multiple bridge components .....	253
Figure 22	– Data Objects and Diagnosis Data Model .....	257
Figure 23	– Example for channel modelling .....	258
Figure 24	– Mapping to device model .....	259
Figure 25	– Identification hierarchy .....	259
Figure 26	– Application Process with application process objects (APOs) .....	261
Figure 27	– Access to a remote APO .....	262
Figure 28	– Access to a remote APO for provider/consumer association .....	263
Figure 29	– Overview of application processes .....	264

Figure 30 – IO device with APs, slots and subslots .....	264
Figure 31 – Example 1 structural units for interfaces and ports within API 0.....	267
Figure 32 – Example 2 structural units for interfaces and ports within API 0.....	267
Figure 33 – FAL ASEs communication architecture.....	268
Figure 34 – Example of one AR with two AREPs.....	270
Figure 35 – Example IO application relationship (one-to-one) .....	273
Figure 36 – Example IO application relationship one-to-many .....	274
Figure 37 – Implicit application relationship .....	275
Figure 38 – State transition diagram DEVSM .....	308
Figure 39 – State transition diagram CTLSM.....	316
Figure 40 – Assignment of Communication Relationship to Application Relationship.....	321
Figure 41 – Overview Communication Relationship Class service interactions .....	324
Figure 42 – Example for an intersection of IO device, slot, and AR .....	387
Figure 43 – Substitute Value.....	417
Figure 44 – State transition diagram RSMSM.....	425
Figure 45 – Ownership handling.....	428
Figure 46 – State transition diagram OWNSM.....	431
Figure 47 – State transition diagram ASSSM .....	431
Figure 48 – State transition diagram PLUGSM.....	443
Figure 49 – State transition diagram PULLSM.....	446
Figure 50 – Location concepts in Asset Management.....	461
Figure 51 – Basic model for isochronous applications .....	476
Figure 52 – General isochronous application model (example CACF == 1) .....	477
Figure 53 – General isochronous application model (example CACF == 2) .....	478
Figure 54 – ASE relations in an IO device operating in isochronous mode for a submodule .....	484
Figure 55 – State transition diagram of ISOM_SYNC .....	486
Figure 56 – State transition diagram ISOM_OUT .....	489
Figure 57 – State transition diagram ISOM_IN .....	494
Figure 59 – CIM overview .....	503
Figure 60 – CIM class principle.....	504
Figure 61 – MRP interconnection .....	588
Figure 62 – State transition diagram SYNC_DIAG.....	599
Figure 63 – Diagnosis Base Model.....	605
Figure 64 – Filtering of diagnosis .....	606
Figure 65 – Filtering hierarchy .....	606
Figure 66 – Severity classification of fault, maintenance and qualified .....	607
Figure 67 – Data Base Model.....	608
Figure 68 – State transition diagram DIAG_DIAG.....	638
Figure 69 – State transition diagram DIAG_MR.....	641
Figure 70 – State transition diagram DIAG_MD.....	645
Figure 71 – State transition diagram DIAG_QUALIFIED .....	649
Figure 72 – Architecture.....	653

Figure 73 – State transition diagram PESM.....	661
Figure 74 – Reporting System components.....	666
Figure 75 – AR / ARSet and Reporting System.....	667
Figure 76 – Max Scan Delay.....	675
Figure 77 – RS Incident window.....	678
Figure 78 – State transition diagram RSOBS.....	683
Figure 79 – State transition diagram RSBUF.....	687
Figure 80 – State transition diagram TimeSM.....	693
Figure 81 – Layers from application to network.....	696
Figure 82 – Assumed application timing model.....	696
Figure 83 – Relations of the IO controller to the Network Management Engine.....	697
Figure 84 – Relations of the IO device to the Network Management Engine.....	698
Figure 85 – Relations of a standalone Network Management Engine.....	698
Figure 86 – Correlation of the Stream Add parameter.....	704
Figure 87 – Interaction of the NME class.....	711
Figure 88 – Interaction of the NCE class.....	714
Figure 89 – Interaction of the TDE class.....	717
Figure 90 – Interaction of the PCE class.....	724
Figure 91 – Interaction of the BNME class.....	727
Figure 92 – Interaction between NME instance and BNME instance.....	727
Figure 93 – Interaction of the NUE class.....	734
Figure 94 – Example of network topology including slower wireless segments.....	735
Figure 95 – Example of media redundancy including wireless segments.....	736
Figure A.1 – Instance model in conjunction with CLRPC.....	739
Figure A.2 – Instance model in conjunction with RSI.....	740
Figure B.1 – Scheme of an Ethernet interface.....	741
Figure B.2 – Scheme of an Ethernet interface with bridging ability.....	742
Figure B.3 – Scheme of an Ethernet interface with optical ports.....	743
Figure B.4 – Scheme of an Ethernet interface with bridging ability using radio communication.....	744
Figure B.5 – Scheme of an Ethernet interface with radio communication.....	744
Figure C.1 – Scheme of MAC address assignment.....	745
Figure D.1 – Measurement of the fast startup time.....	746
Figure E.1 – Frame Layout.....	747
Figure E.2 – Subframe Layout.....	748
Figure E.3 – End to End.....	749
Figure E.4 – Dynamic frame packing.....	749
Figure E.5 – Dynamic frame packing – Truncation of outputs.....	750
Figure E.6 – Dynamic frame packing – Outbound Pack.....	750
Figure E.7 – Dynamic frame packing – Concatenation of inputs.....	751
Figure E.8 – Dynamic frame packing – Inbound Pack.....	752
Figure E.9 – Dynamic frame packing – Distributed watchdog.....	754
Figure E.10 – Interrelation between IO CR and dynamically packed frame.....	754

Table 1 – Data type overview.....	45
Table 2 – V2 octets.....	49
Table 3 – L2 octets.....	50
Table 4 – E2 octets.....	51
Table 5 – E2 value range.....	51
Table 6 – Unipolar2.16 octets.....	51
Table 7 – Unipolar2.16 value range.....	51
Table 8 – N2 value range.....	53
Table 9 – N4 value range.....	54
Table 10 – X2 value range.....	55
Table 11 – X4 value range.....	56
Table 12 – C4 value range.....	56
Table 13 – T2 value range.....	58
Table 14 – T4 value range.....	59
Table 15 – D2 value range.....	60
Table 16 – R2 value range.....	60
Table 17 – TimeStamp status value range.....	62
Table 18 – TimeStampDifference status value range.....	63
Table 19 – F message trailer with 4 octets.....	66
Table 20 – Unsigned16_S octets.....	68
Table 21 – Unsigned16_S meaning.....	69
Table 22 – Integer16_S octets.....	69
Table 23 – Integer16_S meaning.....	69
Table 24 – Unsigned8_S octets.....	70
Table 25 – Unsigned8_S meaning.....	70
Table 26 – OctetString_S octets.....	71
Table 27 – OctetString_S status bits.....	72
Table 28 – RPC Connect.....	84
Table 29 – RPC Release.....	85
Table 30 – RPC Read.....	86
Table 31 – RPC Write.....	87
Table 32 – RPC Control.....	88
Table 33 – RPC Read Implicit.....	89
Table 34 – RSI initiator add.....	93
Table 35 – RSI responder add.....	94
Table 36 – RSI initiator remove.....	95
Table 37 – RSI responder remove.....	96
Table 38 – RSI call.....	97
Table 39 – RSI notification.....	99
Table 40 – RSI initiator abort.....	100
Table 41 – RSI responder abort.....	101
Table 42 – RSI get responder instances.....	102
Table 43 – SNMP Enable SNMP v1/v2.....	105

Table 44 – SNMP Set Community Name .....	106
Table 45 – Add Static ARP Cache Entry .....	112
Table 46 – Remove Static ARP Cache Entry .....	113
Table 47 – PPM Set Prov Data .....	119
Table 48 – PPM Set Prov Status .....	120
Table 49 – PPM Activate .....	121
Table 50 – PPM Close .....	123
Table 51 – PPM Start .....	123
Table 52 – PPM Error .....	124
Table 53 – Get cons data .....	124
Table 54 – CPM Get cons status .....	125
Table 55 – CPM Set RedRole .....	126
Table 56 – CPM Activate .....	127
Table 57 – CPM NoData .....	129
Table 58 – CPM Stop .....	129
Table 59 – CPM New Data Indication .....	130
Table 60 – APMS Activate .....	132
Table 61 – APMR Activate .....	134
Table 62 – APMS A Data .....	136
Table 63 – APMR A Data .....	137
Table 64 – APMR Ack .....	137
Table 65 – APMS Error .....	138
Table 66 – APMS Error ERRCLS/ERRCODE .....	138
Table 67 – APMR Error .....	139
Table 68 – APMR Error ERRCLS/ERRCODE .....	139
Table 69 – APMS_Close .....	139
Table 70 – APMR_Close .....	140
Table 71 – Get .....	150
Table 72 – Set .....	155
Table 73 – Local Get Command .....	161
Table 74 – Local Set Command .....	162
Table 75 – Identify .....	163
Table 76 – Hello .....	170
Table 77 – PN DHCP Discover .....	174
Table 78 – PN DHCP Offer .....	175
Table 79 – System capabilities .....	181
Table 80 – Auto negotiation support and status .....	183
Table 81 – MDI Power Support .....	183
Table 82 – Remote systems data change .....	188
Table 83 – Start bridge .....	203
Table 84 – Start slave .....	204
Table 85 – Start master .....	205
Table 86 – Stop bridge .....	206

Table 87 – Stop slave .....	207
Table 88 – Stop master .....	208
Table 89 – Sync state change .....	208
Table 90 – Line Delay change .....	209
Table 91 – Local Get Time .....	213
Table 92 – Local time state info .....	213
Table 93 – Traffic classes .....	214
Table 94 – Port state change .....	221
Table 95 – Set port state .....	222
Table 96 – Flush filtering data base .....	222
Table 97 – Add FDB entry .....	223
Table 98 – Remove FDB entry .....	223
Table 99 – Config Port .....	224
Table 100 – Stream ID Add .....	232
Table 101 – Stream ID Remove .....	233
Table 102 – Stream Identification .....	234
Table 103 – Stream Active Identification .....	235
Table 104 – Stream Send .....	236
Table 105 – MAU Type change .....	240
Table 106 – Set MAU Type .....	241
Table 107 – P Data .....	242
Table 108 – N Data .....	243
Table 109 – A Data .....	245
Table 110 – C Data .....	246
Table 111 – R Data .....	247
Table 112 – Requirements and features .....	249
Table 113 – Internal components and ports in the interface mounted left or up into the rack .....	252
Table 114 – Internal components and ports mounted interface mounted right or down into the rack .....	252
Table 115 – Binding application relationship services .....	276
Table 116 – Device Access .....	279
Table 117 – Companion AR .....	280
Table 118 – Acknowledge Companion AR .....	280
Table 119 – Time Aware System .....	280
Table 120 – Startup Mode .....	281
Table 121 – Pull Module Alarm Allowed .....	281
Table 122 – Input Valid on Backup AR .....	284
Table 123 – Mode .....	285
Table 124 – APStructureIdentifier with API := 0 .....	285
Table 125 – APStructureIdentifier with API != 0 .....	286
Table 126 – RS Alarm Transport Mode .....	286
Table 127 – Connect .....	289
Table 128 – Connect Device Access .....	294

Table 129 – Release .....	296
Table 130 – Prm Begin .....	298
Table 131 – Prm End .....	299
Table 132 – Application Ready .....	301
Table 133 – Abort .....	302
Table 134 – Local AR Abort .....	302
Table 135 – Local Set AR State .....	303
Table 136 – Local AR In Data .....	303
Table 137 – Data elements of Read AR Data .....	304
Table 138 – Data elements of Expected Fast Startup Data .....	306
Table 139 – Remote primitives issued or received by DEVSM .....	307
Table 140 – Local primitives issued or received by DEVSM .....	307
Table 141 – State table DEVSM .....	309
Table 142 – Functions, Macros, Timers and Variables by DEVSM .....	314
Table 143 – Remote primitives issued or received by CTLSM .....	315
Table 144 – Local primitives issued or received by CTLSM .....	315
Table 145 – State table CTLSM .....	317
Table 146 – Functions, Macros, Timers and Variables used by CTLSM .....	319
Table 147 – Binding communication relationship services .....	325
Table 148 – Traffic Classes versus RT Class .....	327
Table 149 – Local Set Input .....	336
Table 150 – Local Set Input IOCS .....	337
Table 151 – Local Get Input .....	338
Table 152 – Local Get Input IOCS .....	339
Table 153 – Local New Input .....	340
Table 154 – Local Set Output .....	341
Table 155 – Local Set Output IOCS .....	342
Table 156 – Local Get Output .....	343
Table 157 – Local Get Output IOCS .....	344
Table 158 – Local New Output .....	345
Table 159 – Local Set Provider State .....	345
Table 160 – Local Set Redundancy .....	346
Table 161 – Local Set State .....	347
Table 162 – Local Data State Changed .....	347
Table 163 – Binding expected identification services .....	354
Table 164 – Module State .....	356
Table 165 – AR Info .....	360
Table 166 – Ident Info .....	360
Table 167 – General Data definition for identification services .....	361
Table 168 – Data elements of Read Module Diff Block .....	363
Table 169 – Alarm type .....	367
Table 170 – Alarm types attached to diagnosis ASE .....	369
Table 171 – Alarm types attached to ownership .....	370

Table 172 – Alarm types attached to common profiles, profiles, and application .....	370
Table 173 – Binding Alarm services .....	370
Table 174 – Alarm Notification .....	374
Table 175 – Channel Diagnosis .....	376
Table 176 – Manufacturer Specific Diagnosis.....	376
Table 177 – Submodule Diagnosis State.....	377
Table 178 – AR Diagnosis State .....	377
Table 179 – User Structure Identifier .....	378
Table 180 – Semantics of Specifier.....	380
Table 181 – Binding Record Data services.....	388
Table 182 – Read .....	389
Table 183 – Read Services .....	391
Table 184 – Read Implicit .....	394
Table 185 – Read Query .....	395
Table 186 – Read Query Services.....	396
Table 187 – Write .....	396
Table 188 – Write Services .....	397
Table 189 – Data elements of Write Combined Object Container .....	399
Table 190 – Local Write Multiple .....	400
Table 191 – Local New Write Multiple .....	402
Table 192 – Binding real identification services.....	409
Table 193 – Local Add Submodule.....	413
Table 194 – Local Remove Submodule .....	414
Table 195 – Data elements of Read API Data .....	415
Table 196 – Data elements of Read Record Input Data Object Element.....	416
Table 197 – Data elements of Read Record Output Data Object Element .....	419
Table 198 – Data elements of Read Substitute Value.....	420
Table 199 – Selector for Read GSD Data.....	422
Table 200 – Data elements of Read GSD Data .....	422
Table 201 – Remote primitives issued or received by RSMSM .....	424
Table 202 – Local primitives issued or received by RSMSM.....	424
Table 203 – State table RSMSM .....	425
Table 204 – Functions, Macros, Timers and Variables used by RSMSM .....	427
Table 205 – Rules for Submodule State.Ident Info .....	427
Table 206 – Remote primitives issued or received by OWNSM and ASSSM.....	430
Table 207 – Local primitives issued or received by OWNSM .....	430
Table 208 – State table OWNSM .....	432
Table 209 – State table ASSSM.....	438
Table 210 – Functions, Macros, Timers and Variables used by OWNSM.....	439
Table 211 – Functions, Macros, Timers and Variables used by ASSSM .....	440
Table 212 – Rules for Submodule State.AR Info .....	440
Table 213 – Remote primitives issued or received by PLUGSM .....	441
Table 214 – Local primitives issued or received by PLUGSM .....	442

Table 215 – State table PLUGSM .....	444
Table 216 – Functions, Macros, Timers and Variables used by PLUGSM.....	445
Table 217 – Remote primitives issued or received by PULLSM .....	446
Table 218 – Local primitives issued or received by PULLSM.....	446
Table 219 – State table PULLSM .....	447
Table 220 – Functions, Macros, Timers and Variables used by PULLSM .....	448
Table 221 – Binding I&M data services .....	450
Table 222 – Data elements of Read I&M0 Filter Data.....	464
Table 223 – Data elements of Read I&M0 Data.....	467
Table 224 – Data elements of Write I&M1 Data.....	468
Table 225 – Data elements of Write I&M2 Data.....	469
Table 226 – Data elements of Write I&M3 Data.....	469
Table 227 – Data elements of Write I&M4 Data.....	470
Table 228 – Data elements of Read I&M5 Data.....	471
Table 229 – Data elements of Read Asset Management Data .....	474
Table 230 – Binding Isochronous Mode Application services.....	478
Table 231 – Data elements of Write Isochronous Mode Data .....	483
Table 232 – Remote primitives issued or received by ISOM_SYNC.....	485
Table 233 – Local primitives issued or received by ISOM_SYNC .....	485
Table 234 – State table ISOM_SYNC.....	486
Table 235 – Functions, Macros, Timers and Variables used by the ISOM_SYNC .....	487
Table 236 – Remote primitives issued or received for ISOM_OUT .....	487
Table 237 – Local primitives issued or received for ISOM_OUT .....	488
Table 238 – State table ISOM_OUT .....	490
Table 239 – Functions, Macros, Timers and Variables used by the ISOM_OUT .....	492
Table 240 – Remote primitives issued or received for ISOM_IN .....	493
Table 241 – Local primitives issued or received for ISOM_IN.....	493
Table 242 – State table ISOM_IN.....	495
Table 243 – Functions, Macros, Timers and Variables used by the ISOM_IN .....	496
Table 244 – Observer service binding .....	498
Table 245 – Binding Communication Interface Management services .....	505
Table 246 – Subslot number for interface submodules .....	508
Table 247 – Subslot number for port submodules .....	511
Table 248 – Data elements of Read PDev Data .....	518
Table 249 – Data elements of Read PD Real Data.....	519
Table 250 – Data elements of Read PD Expected Data.....	520
Table 251 – Data elements of Read PD Interface Data Real .....	522
Table 252 – Data elements of Write PD Interface Adjust.....	523
Table 253 – Data elements of Write PD Interface FSU Data Adjust.....	523
Table 254 – Data elements of Write PD NC Data Check .....	524
Table 255 – Data elements of Read PD Port Statistic .....	525
Table 256 – Data elements of Read PD Port Data Real .....	526
Table 257 – Data elements of Read PD Port Data Real Extended.....	527

Table 258 – Data elements of Write PD Port Data Check .....	529
Table 259 – Data elements of Write PD Port Data Adjust .....	530
Table 260 – Data elements of Read Port FO Data Real .....	531
Table 261 – Data elements of Write PD Port FO Data Check .....	532
Table 262 – Data elements of Write PD Port FO Data Adjust .....	532
Table 263 – Data elements of Write PD Port SFP Data Check .....	533
Table 264 – Data elements of Read RSI Instances .....	534
Table 265 – Binding IEEE Std 802.1AS services .....	539
Table 266 – Binding IEEE Std 802.1Q bridge services .....	543
Table 267 – Allowed values of Forwarding Mode .....	550
Table 268 – Allowed values of Fast Forwarding Multicast MAC Add .....	550
Table 269 – Tx Port Entry .....	553
Table 270 – Dependencies of RedPeriodBegin and GreenPeriodBegin .....	556
Table 271 – Distributed Watchdog Factor .....	557
Table 272 – Restart Factor For Distributed Watchdog .....	558
Table 273 – DFP Mode .....	558
Table 274 – SFIOCRProperties.DFPRedundantPathLayout .....	559
Table 275 – SFCRC16 .....	559
Table 276 – Data elements of Write PD IR Data .....	570
Table 277 – Data elements of Write PD IR Subframe Data .....	572
Table 278 – Write CIM NetConf Stream Forward Data .....	575
Table 279 – Binding Media Redundancy services .....	577
Table 280 – Data elements of Read PD Interface MRP Data Real .....	579
Table 281 – Data elements of Write PD Interface MRP Data Check .....	581
Table 282 – Data elements of Write PD Interface MRP Data Adjust .....	582
Table 283 – Data elements of Read PD Port MRP Data Real .....	583
Table 284 – Data elements of Write PD Port MRP Data Adjust .....	584
Table 285 – Data elements of Read PD Port MRPIC Data Real .....	585
Table 286 – Data elements of Write PD Port MRPIC Data Check .....	585
Table 287 – Data elements of Write PD Port MRPIC Data Adjust .....	586
Table 288 – Binding PTCP services .....	590
Table 289 – Sync Properties Role .....	593
Table 290 – Sync Class .....	593
Table 291 – Data elements of Write PD Sync Data .....	594
Table 292 – Local Sync State Info .....	596
Table 293 – Local SYNCH Event .....	597
Table 294 – Remote primitives issued or received by SYNC_DIAG .....	598
Table 295 – Local primitives issued or received by SYNC_DIAG .....	598
Table 296 – State table SYNC_DIAG .....	599
Table 297 – Functions, Macros, Timers and Variables used by SYNC_DIAG .....	601
Table 298 – List of supported MIBs .....	601
Table 299 – Cross-referencing of MIB-II objects .....	602
Table 300 – Cross-referencing of LLDP-MIB objects .....	602