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Industrial automation systems and integration — JT file format specification for 3D visualization

Systèmes d'automatisation industrielle et intégration — Spécification de format de fichier JT pour visualisation 3D

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Content

Content iii
Foreword xvi
Introduction xvii
1 Scope 1
2 Normative references 1
3 Terms, definitions and abbreviated terms 1
3.1 Terms and definitions 1
3.2 Abbreviated terms 5
4 Notational conventions 6
5 File Format 14
5.1 File Structure 14
5.1.1 File Header 14
5.1.2 TOC Segment 16
5.1.3 Data Segment 17
5.2 Data Segments 22
6 LSG Segment 24
6.1 Graph Elements 24
6.1.1 Node Elements 25
6.1.2 Attribute Elements 48
6.2 Property Atom Elements 92
6.2.1 Base Property Atom Element 92
6.2.2 String Property Atom Element 93
6.2.3 Integer Property Atom Element 94
6.2.4 Floating Point Property Atom Element 94
6.2.5 JT Object Reference Property Atom Element 95
6.2.6 Date Property Atom Element 96
6.2.7 Late Loaded Property Atom Element 97
6.2.8 Vector4f Property Atom Element 99
6.3 Property Table 99
6.3.1 Element Property Table 100
7 Shape LOD Segment 102
7.1 Shape LOD Element 102
7.1.1 Base Shape LOD Element 102
7.1.2 Vertex Shape LOD Element 103
7.1.3 Tri-Strip Set Shape LOD Element 118
7.1.4 Polyline Set Shape LOD Element 118
7.1.5 Point Set Shape LOD Element 119
7.1.6 Null Shape LOD Element 120
7.2 Primitive Set Shape Element 120
7.2.1 Lossless Compressed Primitive Set Data 122
7.2.2 Lossy Quantized Primitive Set Data 124
8 Geometry Segments 129
8.1 STEP B-Rep Segment 129
8.2 XT B-Rep Segment 129
8.3 JT ULP Segment 129
8.4 JT LWPA Segment 129
8.5 Wireframe Segment 129
8.6 JT B-Rep Element (deprecated) 129
9 Meta Data Segment 131

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9.1 Property Proxy Meta Data Element 131
9.1.1 Date Property Value 133
9.2 PMI Manager Meta Data Element 134
9.2.1 PMI Entities 137
9.2.2 PMI Associations 158
9.2.3 PMI User Attributes 160
9.2.4 PMI String Table 161
9.2.5 PMI Model Views 161
9.2.6 Generic PMI Entities 163
9.2.7 PMI CAD Tag Data 169
9.2.8 PMI Polygon Data 170

10 Data Compression and Encoding 174
10.1 Common Compression Data Collection Formats 174
10.1.1 Int32 Compressed Data Packet 174
10.1.2 Int32 Compressed Data Packet Mk. 2 179
10.1.3 Float64 Compressed Data Packet 185
10.1.4 Compressed Vertex Coordinate Array 189
10.1.5 Compressed Vertex Normal Array 190
10.1.6 Compressed Vertex Texture Coordinate Array 192
10.1.7 Compressed Vertex Colour Array 194
10.1.8 Compressed Vertex Flag Array 196
10.1.9 Point Quantizer Data 197
10.1.10 Texture Quantizer Data 197
10.1.11 Colour Quantizer Data 198
10.1.12 Uniform Quantizer Data 200
10.1.13 Compressed Entity List for Non-Trivial Knot Vector 200
10.1.14 Compressed Control Point Weights Data 204
10.1.15 Compressed Curve Data 205
10.1.16 Compressed CAD Tag Data 208
10.2 Encoding Algorithms 211
10.2.1 Uniform Data Quantization 211
10.2.2 Bitlength CODEC 211
10.2.3 Arithmetic CODEC 212
10.2.4 Deering Normal CODEC 217
10.3 zlib compression 219

11 Common Data Conventions and Constructs 220
11.1 Late-Loading Data 220
11.2 TOC Segment Location 220
11.3 Bit Fields 220
11.4 Empty Field 220
11.5 Local version numbers 220
11.5.1 Version numbers 221
11.6 Hash Value 223
11.7 Scene graph construction 223
11.8 Metadata Conventions 224
11.8.1 CAD Properties 224
11.8.2 PMI Properties 228
11.8.3 Tessellation Properties 324
11.8.4 Miscellaneous Properties 325
11.9 LSG Attribute Accumulation Semantics 326
11.10 LSG Part Structure 327
11.11 Range LOD Node Alternative Rep Selection 327
11.12 Brep Face Group Associations 327
11.13 Handling of different states / variants in a JT file 328
11.13.1 Reference Sets 329
11.14 Watermarks 329
11.14.1 Background 329
11.14.2 Issue – Missing specification in the ISO 330

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11.14.3 Recommended Solution 330
11.14.4 Issue – Protection of data 332

12 Conformance requirements 333

Annex A (informative) Object Type Identifiers 334

Annex B (normative) STEP B-Rep 338
B.1 STEP B-Rep Element 338
B.1.1 STEP B-Rep Data 338
B.1.2 STEP schema 339
B.1.3 STEP format 339
B.1.4 STEP external element reference in ISO 10303-21 339

Annex C (normative) STEP schema 341

Annex D (informative) Coding Algorithms – An Implementation 414
D.1 Common classes 414
D.1.1 CntxEntry class 414
D.1.2 CntxEntryBase2 class 414
D.1.3 ProbabilityContext class 415
D.1.4 ProbContex2 class 416
D.1.5 CodecDriver class 419
D.1.6 CodecDriver2 class 422
D.2 Bitlength decoding classes 426
D.2.1 BitLengthCodec class 426
D.2.2 BitLengthCodec2 class 430
D.3 Arithmetic decoding classes 438
D.3.1 ArithmeticProbabilityRange class 438
D.3.2 ArithmeticCodec class 438
D.3.3 ArithmeticCodec2 class 442
D.4 Deering Normal decoding classes 446
D.4.1 DeeringNormalLookupTable class 446
D.4.2 DeeringNormalCodec class 448

Annex E (informative) Hashing – An Implementation 451

Annex F (informative) Polygon Mesh Topology Coder 454
F.1 DualVFMesh 455
F.2 Topology Decoder 461
F.2.1 MeshCoderDriver class 461
F.2.2 MeshCodec class 464
F.2.3 MeshDecoder class 470

Annex G (informative) XT B- Rep segment 473
G.1 XT B-Rep Element 473
G.1.1 XT B-Rep Data 474
G.2 Procedural Geometry 474
G.2.1 Background 474
G.2.2 Issue 474
G.2.3 Recommended Solution 476
G.3 Non-Manifold Bodies 476
G.3.1 Background 476
G.3.2 Issue 477
G.3.3 Recommended Solution 477

Annex H (informative) XT B- Rep data segment 478
H.1 Introduction to the XT B- Rep data segment 478
H.2 Logical Layout 478
H.2.1 Schema 479
H.2.2 Embedded schemas 479
H.2.3 Field types 480
H.2.4 Variable-length nodes 481
H.2.5 Unresolved indices 481

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H.3 Physical Layout 481
H.3.1 Binary 481
H.4 Model Structure 482
H.4.1 Topology 482
H.4.2 General points 483
H.4.3 Entity definitions 483
H.4.4 Entity matrix 487
H.4.5 Representation of manifold bodies 487
H.5 Schema Definition 489
H.5.1 Underlying types 489
H.5.2 Geometry 489
H.5.3 Topology 521
H.5.4 Associated Data 534
H.6 Node Types 545
H.7 Node Classes 547
H.8 System Attribute Definitions 547
H.8.1 Hatching Attributes 547
H.8.2 Density Attributes 549
H.8.3 Region 551
H.8.4 Colour 551
H.8.5 Reflectivity 551
H.8.6 Translucency 552
H.8.7 Name 552
H.8.8 Incremental faceting 552
H.8.9 Transparency 552
H.8.10 Non-mergeable edges 553
H.8.11 Group merge behaviour 553
H.8.12 Unicode name 553
H.8.13 Monikers 553

Annex I (informative) PMI Data Segment 559

Annex J (informative) Mapping table from ISO 10303-42 to XT B-Rep 560
J.1 Wireframe Geometry 560
J.2 Surfaces without topology 560
J.3 Shapes represented by wireframe models with topology 561
J.4 Manifold Surfaces with Topology 561
J.5 Advanced boundary representation solids 563
J.5.1 Color 564
J.5.2 Name 565
J.5.3 Wireframe style 565
J.5.4 Visibility 566

Annex K (informative) JT B-rep Segment 567
K.1 JT B-Rep Element 567
K.1.1 Topological Entity Counts 569
K.1.2 Geometric Entity Counts 570
K.1.3 Topology Data 571
K.1.4 Geometric Data 580
K.1.5 Topological Entity Tag Counters 589
K.1.6 B-Rep CAD Tag Data 591

Annex L (informative) Wireframe Segment 592
L.1 Wireframe Rep Element 592
L.1.1 Wireframe MCS Curves Geometric Data 594
L.1.2 Wireframe Rep CAD Tag Data 594

Annex M (informative) JT ULP Segment 596
M.1 JT ULP Element 596
M.1.1 Topology Data 598
M.1.2 Geometric Data 615
M.1.3 Material Attribute Element Properties 637

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M.1.4 Information Recovery 638
M.1.5 Non-Manifold Bodies 643
M.2 JT LWPA Segment 643
M.2.1 JT LWPA Element 644
M.2.2 Analytic Surface Geometry 644

Annex N (informative) Change History 647
N.1 General 647
N.2 Changes made in edition 2 647
N.2.1 Summary of the changes 647
N.2.2 Additions made to the document 647
N.2.3 Addition of a new STEP B-rep segment definition 647
N.2.4 Updates of the documentation from the Prostep industrialization quidelines 648
N.2.5 Addition of a conformance clause. 648
N.2.6 Addition of a mapping table JT ISO to STEP. 648
N.2.7 Content modified from edition 1 648
N.2.8 Elements deprecated from edition 1 648

Bibliography 649

Figures

Figure 1 — rectangle box diagram 6
Figure 2 — folder diagram 6
Figure 3 — rectangle box with lines at left and right sides diagram 7
Figure 4 — rectangle box with clipped right side corners 7
Figure 5 — compressed data packet diagram 7
Figure 6 — data type : field name diagram 8
Figure 7 — data filed dependency example 9
Figure 8 — loop construct example 10
Figure 9 — loop construct with iterations example 10
Figure 10 — JT File Structure 14
Figure 11 — File Header data collection 15
Figure 12 — TOC Segment data collection 16
Figure 13 — TOC Entry data collection 17
Figure 14 — Data Segment data collection 18
Figure 15 — Segment Header data collection 18
Figure 16 — Data collection 20
Figure 17 — Logical Element Header data collection 20
Figure 18 — Element Header data collection 20
Figure 19 — Logical Element Header ZLIB data collection 22
Figure 20 — LSG Segment data collection 24
Figure 21 — Base Node Element data collection 25
Figure 22 — Base Node Data collection 25
Figure 23 — Partition Node Element data collection 27
Figure 24 — Vertex Count Range data collection 28
Figure 25 — Group Node Element data collection 29
Figure 26 — Group Node Data collection 30
Figure 27 — Instance Node Element data collection 31
Figure 28 — Part Node Element data collection 32
Figure 29 — Assembly node with SUBNODE 32
Figure 30 — Assembly node without SUBNODE 33
Figure 31 — Displaying Nodes that have SUBNODE properties 33
Figure 32 — Meta Data Node Element data collection 34
Figure 33 — Meta Data Node Data collection 34
Figure 34 — LOD Node Element data collection 34
Figure 35 — LOD Node Data collection 35
Figure 36 — Range LOD Node Element data collection 36
Figure 37 — Switch Node Element data collection 37

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Figure 38 — Base Shape Node Element data collection 38
Figure 39 — Base Shape Data collection 38
Figure 40 —Vertex Count Range data collection 40
Figure 41 — Vertex Shape Node Element data collection 41
Figure 42 — Vertex Shape Data collection 41
Figure 43 — Quantization Parameters data collection 42
Figure 44 — Tri-Strip Set Shape Node Element data collection 42
Figure 45 — Polyline Set Shape Node Element data collection 43
Figure 46 — Point Set Shape Node Element data collection 44
Figure 47 — Polygon Set Shape Node Element data collection 45
Figure 48 — NULL Shape Node Element data collection 45
Figure 49 — Primitive Set Shape Node Element data collection 46
Figure 50 — Primitive Set Quantization Parameters data collection 48
Figure 51 — Base Attribute Data collection 49
Figure 52 — Material Attribute Element data collection 51
Figure 53 — Texture Image Attribute Element data collection 54
Figure 54 — Texture Vers-1 Data collection 56
Figure 55 — Texture Environment data collection 58
Figure 56 — Texture Coord Generation Parameters data collection 61
Figure 57 — Inline Texture Image Data collection 62
Figure 58 — Image Format Description data collection 63
Figure 59 — Texture Vers-2 Data collection 66
Figure 60 — Texture Vers-3 Data collection 69
Figure 61 — Draw Style Attribute Element data collection 72
Figure 62 — Light Set Attribute Element data collection 73
Figure 63 — Infinite Light Attribute Element data collection 74
Figure 64 — Base Light Data collection 75
Figure 65 — Shadow Parameters data collection 76
Figure 66 — Point Light Attribute ElementPoint Light Attribute Element data collection 78
Figure 67 — Spread Angle value with respect to the light cone 79
Figure 68 — Attenuation Coefficients data collection 80
Figure 69 — Linestyle Attribute Element data collection 81
Figure 70 — Pointstyle Attribute Element data collection 82
Figure 71 — Geometric Transform Attribute Element data collection 83
Figure 72 — Shader Effects Attribute Element data collection 85
Figure 73 — Texture Coordinate Generator Attribute Element data collection 87
Figure 74 — Mapping Plane Element data collection 88
Figure 75 — Mapping Cylinder Element data collection 89
Figure 76 — Mapping Sphere Element data collection 90
Figure 77 — Mapping TriPlanar Element data collection 91
Figure 78 — Base Property Atom Element data collection 92
Figure 79 — Base Property Atom Data collection 93
Figure 80 — String Property Atom Element data collection 93
Figure 81 — Integer Property Atom Element data collection 94
Figure 82 — Floating Point Property Atom Element data collection 95
Figure 83 — JT Object Reference Property Atom Element data collection 95
Figure 84 — Date Property Atom Element data collection 96
Figure 85 — Late Loaded Property Atom Element data collection 98
Figure 86 — Vector4f Property Atom Element data collection 99
Figure 87 — Property Table data collection 100
Figure 88 — Element Property Table data collection 101
Figure 89 — Shape LOD Segment data collection 102
Figure 90 — Base Shape LOD Element data collection 102
Figure 91 — Base Shape LOD Data collection 103
Figure 92 — Vertex Shape LOD Element data collection 103
Figure 93 — Vertex Shape LOD Data collection 104
Figure 94 — TopoMesh LOD Data collection 106
Figure 95 — TopoMesh LOD Data collection 106
Figure 96 — TopoMesh Topologically Compressed LOD Data collection 107

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Figure 97 — Topologically Compressed Rep Data Collection 108
Figure 98 — Topologically Compressed Vertex Records data collection 111
Figure 99 — TopoMesh Compressed Rep Data V1 data collection 112
Figure 100 — TopoMesh Compressed Rep Data V2 data collection 115
Figure 101 — Tri-Strip Set Shape LOD Element data collection 118
Figure 102 — Polyline Set Shape LOD Element data collection 119
Figure 103 — Point Set Shape LOD Element data collection 119
Figure 104 — Null Shape LOD Element data collection 120
Figure 105 — Primitive Set Shape Element data collection 121
Figure 106 — Lossless Compressed Primitive Set Data collection 123
Figure 107 — Lossy Quantized Primitive Set Data collection 125
Figure 108 — Compressed params1 data collection 127
Figure 109 — Meta Data Segment data collection 131
Figure 110 — Meta Data Segment data collection 132
Figure 111 — Date Property Value data collection 134
Figure 112 — PMI Manager Meta Data Element data collection 135
Figure 113 — PMI Entities data collection 137
Figure 114 — PMI Dimension Entities data collection 137
Figure 115 — PMI 2D Data collection 138
Figure 116 — PMI Base Data collection 139
Figure 117 — 2D-Reference Frame data collection 140
Figure 118 — 2D Text Data collection 140
Figure 119 — Text Box data collection 142
Figure 120 — Constructing Text Polylines from data arrays 143
Figure 121 — Text Polyline Data collection 144
Figure 122 — Constructing Non-Text Polylines from packed 2D data arrays 145
Figure 123 — Non-Text Polyline Data collection 146
Figure 124 — PMI Note Entities data collection 147
Figure 125 — PMI Datum Feature Symbol Entities data collection 148
Figure 126 — PMI Datum Target Entities data collection 148
Figure 127 — PMI Feature Control Frame Entities data collection 149
Figure 128 — PMI Line Weld Entities data collection 149
Figure 129 — PMI Spot Weld Entities data collection 150
Figure 130 — PMI 3D Data collection 151
Figure 131 — PMI Surface Finish Entities data collection 152
Figure 132 — PMI Measurement Point Entities data collection 153
Figure 133 — PMI Locator Entities data collection 154
Figure 134 — PMI Reference Geometry Entities data collection 154
Figure 135 — PMI Design Group Entities data collection 155
Figure 136 — Design Group Attribute data collection 156
Figure 137 — PMI Coordinate System Entities data collection 157
Figure 138 — PMI Associations data collection 158
Figure 139 — PMI User Attributes data collection 160
Figure 140 — PMI String Table data collection 161
Figure 141 — PMI Model Views data collection 162
Figure 142 — Generic PMI Entities data collection 164
Figure 143 — PMI Property data collection 166
Figure 144 — PMI Property Atom data collection 168
Figure 145 — PMI CAD Tag Data collection 169
Figure 146 — PMI Polygon Data 171
Figure 147 — Int32 Compressed Data Packet data collection 175
Figure 148 — Int32 Probability Contexts data collection 177
Figure 149 — Int32 Probability Context Table Entry data collection 178
Figure 150 — Int32 Compressed Data Packet Mk. 2 data collection 181
Figure 151 — Int32 Probability Contexts Mk. 2 data collection 183
Figure 152 — Int32 Probability Context Table Entry Mk. 2 data collection 184
Figure 153 — Float64 Compressed Data Packet data collection 186
Figure 154 — Float64 Probability Contexts data collection 188
Figure 155 — Float64 Probability Context Table Entry data collection 188

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Figure 156 — Compressed Vertex Coordinate Array data collection 189
Figure 157 — Compressed Vertex Normal Array data collection 191
Figure 158 — Compressed Vertex Texture Coordinate Array data collection 193
Figure 159 — Compressed Vertex Colour Array data collection 195
Figure 160 — Compressed Vertex Flag Array data collection 197
Figure 161 — Point Quantizer Data collection 197
Figure 162 — Texture Quantizer Data collection 198
Figure 163 — Colour Quantizer Data collection 199
Figure 164 — Uniform Quantizer Data collection 200
Figure 165 — Compressed Entity List for Non-Trivial Knot Vector data collection 202
Figure 166 — Compressed Control Point Weights Data collection 204
Figure 167 — Compressed Curve Data collection 205
Figure 168 — Non-Trivial Knot Vector NURBS Curve Indices data collection 207
Figure 169 — NURBS Curve Control Point Weights data collection 207
Figure 170 — NURBS Curve Control Points data collection 207
Figure 171 — Compressed CAD Tag Data collection 209
Figure 172 — Compressed CAD Tag Type-2 Data collection 210
Figure 173 — Sextant Coding on the Sphere 218
Figure 174 — ISO 14306 format Convention for Modelling each Part in LSG 327
Figure 175 — CAD Component with Reference sets 329
Figure 176 — Watermark Example 330
Figure 177 — JT Data with Watermark in JT2GO 331
Figure 178 — JT Data with Watermark in LiteBox3D - ISO based JT Viewer 332
Figure 179 — STEP B-Rep Element data collection 338
Figure 180 — XT B-Rep Element data collection 473
Figure 181 — Non-manifold body 477
Figure 182 — Split a face 556
Figure 183 — Merge faces 557
Figure 184 —JT B-Rep Segment data collection 567
Figure 185 — JT B-Rep Segment data collection 568
Figure 186 — Topological Entity Counts data collection 569
Figure 187 — Geometric Entity Counts data collection 570
Figure 188 — Topology Data collection 571
Figure 189 — Regions Topology Data collection 572
Figure 190 — Shells Topology Data collection 573
Figure 191 — Trim Loop example in parameter Space - One Face with 2 Holes 574
Figure 192 — Faces Topology Data collection 575
Figure 193 — Loops Topology Data collection 576
Figure 194 — CoEdges Topology Data collection 577
Figure 195 — Edges Topology Data collection 578
Figure 196 — Vertices Topology Data collection 579
Figure 197 — Geometric Data collection 580
Figure 198 — Surfaces Geometric Data collection 581
Figure 199 — Non-Trivial Knot Vector NURBS Surface Indices data collection 582
Figure 200 — NURBS Surface Degree data collection 583
Figure 201 — NURBS Surface Control Point Counts data collection 583
Figure 202 — NURBS Surface Control Point Weights data collection 584
Figure 203 — NURBS Surface Control Points data collection 584
Figure 204 — NURBS Surface Knot Vectors data collection 585
Figure 205 — NURBS Surface Knot Vectors collection 585
Figure 206 — Trivial PCS Curves data collection 586
Figure 207 — Equality of corresponding curve end coordinates of opposite sides of the box 587
Figure 208 — MCS Curves Geometric Data collection 589
Figure 209 — Point Geometric Data collection 589
Figure 210 — Topological Entity Tag Counters data collection 590
Figure 211 — B-Rep CAD Tag Data collection 591
Figure 212 — wireframe segment data collection 592
Figure 213 — Wireframe Rep Element data collection 593
Figure 214 — Wireframe MCS Curves Geometric Data collection 594

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Figure 215 — Wireframe Rep CAD Tag Data collection 595
Figure 216 — JT ULP Segment data collection 596
Figure 217 — JT ULP Element data collection 597
Figure 218 — Topology Data collection 598
Figure 219 — Topological Entity Counts data collection 599
Figure 220 — Combined Predictor Type data collection 600
Figure 221 — Regions Topology Data collection 601
Figure 222 — Shells Topology Data collection 602
Figure 223 —Faces Topology Data collection 603
Figure 224 —Loops Topology Data collection 606
Figure 225 — CoEdges Topology Data collection 608
Figure 226 — Surface Domain Classification 610
Figure 227 — Edges Topology Data collection 612
Figure 228 — Vertices Topology Data collection 614
Figure 229 — Geometric Data collection 615
Figure 230 — Geometric Entity Counts data collection 616
Figure 231 — Degree Table data collection 617
Figure 232 — Recover Nurbs Degree 618
Figure 233 — Number of Control Points Table data collection 619
Figure 234 — Recover Number of Control Points 620
Figure 235 — Dimension Table data collection 621
Figure 236 — Recover Dimension 622
Figure 237 —3D Unit Vector Table data collection 623
Figure 238 — Recover Dimension 624
Figure 239 —2D Unit Vector Table data collection 625
Figure 240 —Recover 2D Unit Vector 625
Figure 241 — 3D MCS Point Table data collection 626
Figure 242 — Recover 3D MCS Points 627
Figure 243 — Knot Vector Table data collection 628
Figure 244 — Recover Knot Vectors 629
Figure 245 — 1D MCS Table data collection 631
Figure 246 — Recover 1D MCS Table 632
Figure 247 — PCS Value Table data collection 633
Figure 248 — Recover PCS Value Table 634
Figure 249 — Radian Table data collection 634
Figure 250 — Recover Radian Table 635
Figure 251 — Weight Table data collection 636
Figure 252 — Recover Weight Table 637
Figure 253 — Material Attribute Element Properties 638
Figure 254 — Material Attribute Element Properties 639
Figure 255 — PCS Curve Recovery from Surface Domain 640
Figure 256 — MCS Curve Recovery 641
Figure 257 — MCS Curve Recovery from Surface Geometry 642
Figure 258 — PCS Curve Recovery from MCS Curve and Surface Geometry 643
Figure 259 — JT LWPA Segment data collection 643
Figure 260 — JT LWPA Element data collection 644
Figure 261 — Analytic Surface Geometry data collection 645
Figure 262 — Analytic Surface Creation 646

Tables

Table 1 — Symbols 6
Table 2 — Predictor Type 8
Table 3 — Basic Data Types 10
Table 4 — Composite Data Types 11
Table 5 — Segment attributes 17
Table 6 — Segment Types 18

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Table 7 — Object Base Types 21
Table 8 — Compression flag values 22
Table 9 — Compression algorithm values 22
Table 10 — Node Flag values 26
Table 11 — Partition flag bits 27
Table 12 — SUBNODE Property 33
Table 13 — Compression level values 39
Table 14 — Texture Coord Binding values 47
Table 15 — Version Number values 47
Table 16 — Texture Coord Gen Type values 47
Table 17 — State Flag values 49
Table 18 — Material Attribute data field inhibit values 50
Table 19 — Material Attribute Version number value 52
Table 20 — Material Attribute Data Flag values 52
Table 21 — Texture Image Attribute data field inhibit values 53
Table 22 — Texture Image Version Number values 54
Table 23 — Texture Vers-1 type values 56
Table 24 — Texture Vers-1 Inline Image Storage Flag values 57
Table 25 — Texture Vers-1 Texture Environment Border Mode values 58
Table 26 — Texture Vers-1 Texture Environment Mipmap Magnification Filter values 59
Table 27 — Texture Vers-1 Texture Environment Mipmap Minification Filter values 59
Table 28 — Texture Vers-1 Texture Environment S-Dimen Wrap Mode values 60
Table 29 — Texture Vers-1 Texture Environment Blend Type values 60
Table 30 — Texture Vers-1 Texture Environment Internal Compression Level values 60
Table 31 — Texture Vers-1 Texture Coord Generation Gen Mode values 61
Table 32 — Texture Vers-1 Image Format Description Pixel Format values 63
Table 33 — Texture Vers-1 Image Format Description Pixel Data values 64
Table 34 — Texture Vers-1 Image Format Description Dimensionality values 64
Table 35 — Texture Vers-1 Image Format Description Shared Image Flag values 65
Table 36 — Texture Vers-2 Texture Type values 67
Table 37 — Texture Vers-2 Inline Image Storage Flag values 68
Table 38 — Texture Vers-3 Texture Type values 70
Table 39 — Texture Vers-3 Inline Image Storage Flag values 71
Table 40 — Draw Style Attribute Field Inhibit flag values 71
Table 41 — Draw Style Attribute Data Flag values 72
Table 42 — Light Set Attribute Version Number values 75
Table 43 — Base Light Data Cood System values 76
Table 44 — Base Light Data Shadow Caster Flag values 76
Table 45 — Point Light Attribute Version Number values 79
Table 46 — Point Light Attribute Spread Angle values 79
Table 47 — Linestyle Attribute Data Flag values 81
Table 48 — Pointstyle Attribute Data Flag values 82
Table 49 — Geometric Transform Attribute Stored Value Mask individual bit-flag values 84
Table 50 — Shader Effects Attribute Enable Flag values 85
Table 51 — Shader Effects Attribute Phong Shading Flag values 86
Table 52 — Mapping Plane Matrix Coordinate System values 88
Table 53 — Mapping Cylinder Matrix Coordinate System values 89
Table 54 — Mapping Sphere Matrix Coordinate System values 91
Table 55 — Mapping TriPlanar Matrix Coordinate System values 92
Table 56 — Vertex Shape LOD Bindings values 104
Table 57 — TopoMesh Compressed Rep Data V2 Field Type values 116
Table 58 — Primitive Set Shape Texture Coord Binding values 121
Table 59 — Primitive Set Shape Version Number values 122
Table 60 — Primitive Set Shape Texture Coord Gen Type values 122
Table 61 — Lossless Compressed Primitive Set Data Field values 123
Table 62 — Primitive Set “params#” Data Fields Interpretation 124
Table 63 — Property Proxy Meta Data Property Value Type values 133
Table 64 — PMI Manager Meta Data Version Number values 136
Table 65 — PMI 2D Base Data Font values 141

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Table 66 — PMI 2D Non-Text Polyline Type values 146
Table 67 — PMI 3D Data Polyline Dimensionality values 151
Table 68 — PMI Reference Geometry Entity values 154
Table 69 — PMI Design Group Attribute Type values 156
Table 70 — PMI Associations Source Data values 158
Table 71 — PMI Associations Reason Code values 159
Table 72 — PMI Model Views Active Flag values 163
Table 73 — Generic PMI Entity Type values 165
Table 74 — Generic PMI User Flag values 166
Table 75 — Common Property Keys and Their Value Encoding formats 167
Table 76 — PMI Property Atom Hidden Flag values 168
Table 77 — Common Compression CODEC Type values 176
Table 78 — Int32 Probability Contexts CODEC Type values 182
Table 79 — Float64 Compressed Data Packet CODEC Type values 186
Table 80 — Colour Quantizer values 198
Table 81 — Colour Quantizer HSV Flag values 199
Table 82 — Knot Type Exist Flag values 202
Table 83 — Compressed Curve Base Type values 206
Table 84 — NURB UV Curve entity dimensionality values 206
Table 85 — NURB XYZ Curve entity dimensionality values 206
Table 86 — Compressed CAD Tag Type values 210
Table 87 — Example assigned probability values 214
Table 88 — Example “probability line” values 214
Table 89 — Example input integer sequence values 214
Table 90 — Example integer number sequence values 215
Table 91 — CAD Property Conventions 224
Table 92 — CAD Optional Property Units 228
Table 93 — PMI Properties 229
Table 94 —Tessellation Property values 324
Table 95 — Miscellaneous Property values 325
Table 96 — Texture watermark properties 330
Table 97 — Object Type Identifiers 334
Table 98 — Object Nodes 479
Table 99 — Field types in order one by one 480
Table 100 — Entity Matrix relations 487
Table 101 — Curve node common fields 490
Table 102 — Line Fields 491
Table 103 — Circle fields 492
Table 104 — Ellipse fields 493
Table 105 — NURB curve fields 496
Table 106 — Curve intersection fields 499
Table 107 — Trimmed curve fields 502
Table 108 — SP curve fields 503
Table 109 — Surface node fields 504
Table 110 — Plane fields 504
Table 111 — Cylinder fields 505
Table 112 — Cone fields 506
Table 113 — Sphere fields 507
Table 114 — Torus fields 508
Table 115 — Blended edge fields 509
Table 116 — Blend boundary surface fields 511
Table 117 — Offset surface fields 511
Table 118 — B-Surface fields 512
Table 119 — NURB Surface fields 513
Table 120 — Swept surface fields 517
Table 121 — Spun surface fields 518
Table 122 — Point fields 519
Table 123 — Transform fields 519
Table 124 — Transform action fields 520

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Table 125 — Geometry owner fields 521
Table 126 — World topology fields 521
Table 127 — Assembly fields 522
Table 128 — Instance fields 524
Table 129 — Body fields 525
Table 130 — Geometry to Topology attachment 528
Table 131 — Region fields 528
Table 132 — Shell fields 529
Table 133 — Face fields 529
Table 134 — Loop fields 530
Table 135 — Fin fields 531
Table 136 — Vertex fields 532
Table 137 — Edge fields 532
Table 138 — Associated List 534
Table 139 — Pointer List Block 535
Table 140 — Attribute Definition ID 535
Table 141 — Field Names 536
Table 142 — Attribute definition 536
Table 143 — Attribute definition action fields 537
Table 144 — Corresponding attribute classes 537
Table 145 — Attribute fields 539
Table 146 — Integer values 541
Table 147 — Real values 541
Table 148 — Character values 541
Table 149 — Unicode values 541
Table 150 — Point values 542
Table 151 — Vector values 542
Table 152 — Direction values 542
Table 153 — Axis values 542
Table 154 — Tag values 543
Table 155 — Group fields 543
Table 156 — Group member fields 544
Table 157 — Node types 545
Table 158 — Node classes 547
Table 159 — Hatching 547
Table 160 — Planar Hatch 548
Table 161 — Radial Hatch 548
Table 162 — Parametric Hatch 548
Table 163 — Body Density 549
Table 164 — Region Density 549
Table 165 — Face Density 550
Table 166 — Edge Density 550
Table 167 — Vertex Density 550
Table 168 — Region 551
Table 169 — Colour 551
Table 170 — Reflectivity 551
Table 171 — Translucency 552
Table 172 — Name 552
Table 173 — Incremental faceting 552
Table 174 — Transparency 552
Table 175 — Non-mergable edges 553
Table 176 — Group merge behaviour 553
Table 177 — Unicode name 553
Table 178 — Moniker attribute use example 555
Table 179 — MONIKER/GUID_TABLE_ATTRIB and MONIKER/MONIKER_DATA_ATTRIB 557
Table 180 — MONIKER/BODY_ID_ATTRIB 558
Table 181 — JT B-Rep Shell Topology Anti-Hole Flag values 573
Table 182 — JT B-Rep Face Reverse Normal Flag values 576
Table 183 — JT B-Rep Loops Topology Data Anti-Hole Flag values 577

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Table 184 — JT B-Rep MCS Curve Reversed Flag values 578
Table 185 — JT B-Rep Surface Base Type value 582
Table 186 — JT B-Rep NURBS Surface Control Point Dimensionality values 582
Table 187 — Trivial Domain Loops Exist Flag values 587
Table 188 — Trivial Box Loops Exist Flag values 587
Table 189 — Trivial Domain UV Curves Exist Flag values 588
Table 190 — Trivial UV Curve Para Domain Side Codes values 588
Table 191 — JT ULP Shell Anti-Hole Flag values 602
Table 192 — JT ULP Flag Bit Array Look Index values 604
Table 193 — JT ULP Supported Surface Type values 605
Table 194 — JT ULP Supported Knot Type Values 605
Table 195 — JT ULP Face Reverse Normal Flag values 605
Table 196 — JT ULP Loops Topology Flag Bit Array values 606
Table 197 — JT ULP Loops Topology Reverse Normal Flag values 607
Table 198 — JT ULP Recover Edge Indices Flag Bit Array values 609
Table 199 — JT ULP Recover Edge Indices PCS curve type values 610
Table 200 — JT ULP PCS Curve Type values 610
Table 201 — JT ULP PCS Curve Type XYZ Reversed Flag values 611
Table 202 — JT ULP PCS Curve Type isUVInc Flag values 611
Table 203 — JT ULP Edges Topology Recover MCS Curve Indices Flag Bit Array values 613
Table 204 — JT ULP Edges Topology Recover MCS Curve Type values 613
Table 205 — Parameter Domain 631

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

This second edition cancels and replaces the first edition (ISO 14306:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

- addition of a STEP B-Rep Segment based on the ISO 10303 STEP suite of standards;
- addition of a new geometry chapter listing all geometry segments in the annexes;
- updates of the documentation from the ProSTEP iViP industrialization guidelines;
- addition of a conformance clause;
- addition of a mapping table JT ISO to STEP;
- deprecation of the JT Brep segment;
- deprecation of the PMI data segment which is superseded by the meta data segment.

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Introduction

The ISO 14306 format is an industry focused, high-performance, lightweight, flexible file format for capturing and repurposing 3D product definition data for visualization to enable collaboration and validation throughout the extended enterprise. The ISO 14306 format is streamable and contains compression for compact and efficient representation.

Some of the highlights of the ISO 14306 format include:

- built-in support for assemblies, sub-assemblies and part constructs;
- a flexible partitioning scheme, supporting single or multiple files;
- b-rep solid shape representations to provide precision to the light-weight viewing processes;
- product manufacturing information in support of paperless manufacturing initiatives;
- precise and imprecise wireframe shape representations;
- discrete purpose-built levels of detail;
- triangle sets, polygon sets, point sets, line sets and implicit primitive sets (such as cylinder, cone and sphere);
- a full array of visual attributes such as for materials, textures, lights;
- hierarchical bounding box and bounding spheres;
- data compression that allows producers of JT files to fine tune the trade-off between compression ratio and fidelity of the data.

Beyond the data contents description of the ISO 14306 format, the overall physical structure/organization of the format is also designed to support operations such as:

- offline optimizations of the data contents, i.e. file granularity and flexibility optimized to meet the needs of enterprise data translation solutions;
- asynchronous streaming of content, i.e. viewing optimizations such as view frustum and occlusion culling and fixed-framerate display modes;
- layers, and layer filters.

NOTE This document is based on the JT Open version 9.5 specification, which defines a scene graph with geometry specific node and attribute support, extended to support ISO 10303.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents USA 20110199382, 8019788.

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Industrial automation systems and integration — JT file format specification for 3D visualization

1 Scope

This document defines the syntax and semantics of a file format for the 3D visualization and interrogation of lightweight geometry and product manufacturing information derived from CAD systems, using visualization software tools that do not need the full capability of a CAD system.

This document has been adopted as a 3D visualization capability in addition to the ISO 10303 series.

The ISO 10303 series are the ISO standards adopted for the engineering data exchange, sharing and long term archiving of product definition information throughout the product lifecycle.

In this document 3D visualization is defined as the visual presentation on a screen or another media of graphical and textual 3 dimensional representations of a set of data representing an object, information or results of a computational process in order to enable decision process by a human looking at the data visualized in a medium.

The file format supports the following information:

- facet information (triangles), stored with geometry compression techniques
- visual attributes such as lights, textures and materials
- product manufacturing information, such as dimensions, tolerances and other attributes
- boundary representation (b-rep) solid model shape representations. Several alternatives are available, including a representation based on the geometry standard defined in ISO 10303
- configuration representations
- delivery methods such as asynchronous streaming of content

The document does not specify the implementation of, or definition of a run-time architecture for viewing or processing of the file format.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10303-21:2014, *Industrial automation systems and integration — Product data representation and exchange — Part 21: Implementation methods: Clear text encoding of the exchange structure*

ISO 10303-42:2014, *Industrial automation systems and integration – Product data representation and exchange – Part 42: Integrated generic resource: geometric and topological representation*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

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