PDS Standards Reference
Table of Contents

Chapter 1. Introduction 1-1
1.1 PDS Data Policy 1-1
1.2 Purpose 1-1
1.3 Scope 1-1
1.4 Audience 1-1
1.5 Document Organization 1-2
1.6 Other Reference Documents 1-2
1.7 Online Document Availability 1-3

Chapter 2. Cartographic Standards 2-1
2.1 Introduction 2-1
2.1.1 International and NASA Advisory Groups for Cartographic Stds 2-1
2.2 Inertial Reference Frame and Time System 2-2
2.3 Spin Axes and Prime Meridians 2-3
2.4 Body-Fixed Planetary Coordinate Systems 2-4
2.4.1 Planets and Satellites 2-5
2.4.2 Small Bodies 2-6
2.4.3 Rings 2-6
2.4.4 Planetary Plasma Interactions 2-6
2.5 Surface Models 2-7
2.6 PDS Keywords for Cartographic Coordinates 2-7
2.7 Map Resolution 2-9
2.8 References 2-10

Chapter 3. DATA_TYPE Values and Data File Storage Formats 3-1
3.1 Data Elements 3-1
3.2 Data Types 3-1
3.3 Binary Integers 3-4
3.4 Signed vs. Unsigned Integers 3-4
3.5 Floating Point Formats 3-5
3.6 Bit String Data 3-5
3.7 Character Data 3-5
3.8 Format Specifications 3-5
3.9 Internal Representations of Data Types 3-6

Chapter 4. Data Objects and Products 4-1
4.1 Data Product File Configurations 4-2

Chapter 5. Data Product Labels 5-1
5.1 Format of PDS Labels 5-1
5.1.1 Labeling methods 5-1
5.1.2 Label format 5-1

5.2 Data Product Label Content 5-4
5.2.1 Attached and Detached Labels 5-4
5.2.2 Combined Detached Labels 5-4
5.2.3 Minimal Labels 5-6
5.2.3.1 Implicit File Object (Attached and Detached Minimal Label) 5-8
5.2.3.2 Explicit File Object (Detached Minimal Label) 5-8
5.3 Detailed Label Contents Description 5-8
5.3.1 Label Standards Identifiers 5-9
5.3.2 File Characteristic Data Elements 5-10
5.3.3 Data Object Pointers 5-11
5.3.3.1 Use of Pointers in Attached Labels 5-11
5.3.3.2 Use of Pointers in Detached and Combined Detached Labels 5-12
5.3.3.3 Note Concerning Minimal Attached and Detached Labels 5-14
5.3.4 Data Identification Elements 5-14
5.3.4.1 Spacecraft Science Data Products 5-15
5.3.4.2 Earthbased Science Data Products 5-15
5.3.4.3 Ancillary Data Products 5-15
5.3.5 Descriptive Data Elements 5-16
5.3.6 Data Object Definitions 5-16
5.3.7 End Statement 5-17
5.4 Syntax for Element Values 5-17
5.5 Locally-defined Data Elements 5-18
5.5.1 Justification for Locally-defined Data Elements 5-18
5.5.2 Identification of Locally-defined Data Elements 5-20
5.5.3 Review and Use of Locally-defined Data Elements 5-20

Chapter 6. Data Set/Data Set Collection Contents and Naming 6-1
6.1 Data Set Naming and Identification 6-2
6.2 Data Set Collection Naming and Identification 6-3
6.3 Name and ID Components 6-4
6.3.1 Restrictions on DATA_SET_ID and DATA_SET_COLLECTION_ID 6-4
6.3.2 Standard Acronyms, Abbreviations, and Assignments 6-4
6.4 Examples 6-8

Chapter 7. Date/Time Format 7-1
7.1 Date/Times 7-1
7.2 Dates 7-2
7.2.1 Conventional Dates 7-2
7.2.2 Native Dates 7-2
7.3 Times 7-2
7.3.1 Conventional Times 7-2
7.3.2 Native Times 7-3
7.4 Midnight and Leap Seconds 7-3
7.4.1 Midnight 7-4
7.4.2 Leap Seconds 7-4

Chapter 8. Directory Types and Naming 8-1
8.1 Standard Directory Names 8-1
8.2 Formation of Directory Names 8-2
8.3 Path Formation Standard 8-4
8.4 Tape Volumes 8-4
8.5 Exceptions to These Standards 8-4

Chapter 9. Documents 9-1
9.1 PDS Objects for Documents 9-2
9.1.1 TEXT Objects 9-2
9.1.2 DOCUMENT Objects 9-2
9.2 Document Format Details 9-3
9.2.1 Flat ASCII Text 9-3
9.2.2 ASCII Text Containing Markup Language 9-4
9.2.2.1 Hyper-Text Markup Language (HTML) Files 9-4
9.2.2.2 Location of Files 9-4
9.2.2.3 Discouraged HTML 3.2 Capabilities 9-4
9.2.3 Non-ASCII Formats 9-5
9.2.4 Validation 9-5
9.3 Examples 9-5
9.3.1 Simple Example of Attached label (Plain ASCII Text) 9-5
9.3.2 Complex Example of Detached Label (Two Document Versions) 9-5
9.3.3 Complex Example of Detached Label (Documents Plus Graphics) 9-6

Chapter 10. File Specification and Naming 10-1
10.1 File Specification Standards 10-1
10.1.1 ISO 9660 Level 1 Specification 10-2
10.1.2 ISO 9660 Level 2 Specification 10-2
10.1.3 Specification for Files Delivered Electronically 10-3
10.2 Reserved Directory Names, File Names and Extensions 10-3
10.2.1 Reserved Directory Names 10-3
10.2.2 Reserved File Names 10-3
10.2.3 Reserved Extensions 10-4
10.3 Guidelines for Naming Sequential Files 10-4

Chapter 11. Media Formats for Data Submission and Archive 11-1
11.1 CD-ROM Recommendations 11-2
11.1.1 Use of Variant Formats 11-2
11.1.2 Premastering Recommendation 11-2
11.2 DVD Recommendations 11-2
11.2.1 Use of Variant Formats 11-2
11.2.2 Premastering Recommendation 11-2
11.2.3 Recommended DVD Formats 11-2
11.3 Packaging Software Files on a CD or DVD 11-3
11.4 Software Packaging Under Previous Versions of the Standard 11-3

Chapter 12. Object Description Language Specification and Usage 12-1
12.1 About the ODL Specification 12-1
12.1.1 Implementing ODL 12-2
12.1.1.1 Language Subsets 12-2
12.1.1.2 Language Supersets 12-2
12.1.1.3 PDS Implementation of PVL-Specific Extensions 12-2
12.1.2 Notation 12-3
12.2 Character Set 12-3
12.2.1 ODL Character Set - Letters 12-4
12.2.2 ODL Character Set - Digits 12-4
12.2.3 ODL Character Set - Special Characters 12-4
12.2.4 ODL Character Set - Spacing Characters 12-5
12.2.5 ODL Character Set - Format Effectors 12-5
12.2.6 ODL Character Set - Control Characters 12-6
12.3 Lexical Elements 12-6
12.3.1 Numbers 12-6
12.3.1.1 Integer Numbers in Decimal Notation 12-6
12.3.1.2 Integer Numbers in Based Notation 12-7
12.3.1.3 Real Numbers 12-7
12.3.2 Dates and Times 12-8
12.3.2.1 Date and Time Values 12-8
12.3.2.2 Implementation of Dates and Times 12-9
12.3.2.3 PDS Implementation of Dates and Times 12-9
12.3.2.4 Dates 12-9
12.3.2.5 Times 12-9
12.3.2.5.1 Combining Date and Time 12-10
12.3.3 Strings 12-10
12.3.3.1 Text Strings 12-10
12.3.3.2 Symbol Strings 12-11
12.3.4 Identifiers 12-11
12.3.4.1 Reserved Identifiers 12-12
12.3.5 Special Characters 12-12
12.4 Statements 12-12
12.4.1 Lines and Records 12-13
12.4.2 Attribute Assignment Statement 12-14
12.4.3 Pointer Statement 12-14
12.4.4 OBJECT Statement 12-15
12.4.4.1 Implementation of OBJECT Statements 12-16
12.4.5 GROUP Statement 12-16
12.4.5.1 Implementation of GROUP Statements 12-17
12.4.5.2 PDS Usage of GROUP 12-17
12.5 Values 12-17
12.5.1 Numeric Values 12-17
12.5.2 Units Expressions 12-18
12.5.2.1 Implementation of Numeric Values 12-18
12.5.3 Text String Values 12-19

12.5.3.1 Implementation of String Values 12-19
12.5.3.1.1 PDS Text String Formatting Conventions 12-20
12.5.4 Symbolic Literal Values 12-20
12.5.4.1 Implementation of Symbolic Literal Values 12-21
12.5.4.2 PDS Convention for Symbolic Literal Values 12-21
12.5.5 Sequences 12-21
12.5.6 Sets 12-22
12.5.6.1 PDS Restrictions on Sets 12-22
12.6 ODL Summary 12-22
12.7 Differences Between ODL Versions 12-24
12.7.1 Differences from ODL Version 1 12-24
12.7.1.1 Ranges 12-24
12.7.1.1.1 Delimiters in Sequences and Sets 12-25
12.7.1.1.2 Exponentiation Operator in Units Expressions 12-25
12.7.2 Differences from ODL Version 0 12-25
12.7.2.1 Date-Time Format 12-25
12.7.3 ODL/PVL Usage 12-25

Chapter 13. PDS Objects / Groups 13-1
13.1 Generic and Specific Data Object Definitions 13-1
13.1.1 Primitive Objects 13-2
13.2 Generic and Specific Data Group Definitions 13-3
13.2.1 Implementation of Group Statements 13-4

Chapter 14. Pointer Usage 14-1
14.1 Types of Pointers 14-1
14.1.1 Data Location Pointers (Data Object Pointers) 14-1
14.1.2 Include Pointers 14-1
14.1.3 Related Information Pointers (Description Pointers) 14-2
14.2 Rules for Resolving Pointers 14-2

Chapter 15. Record Formats 15-1
15.1 FIXED_LENGTH Records 15-1
15.2 STREAM Records 15-2
15.3 VARIABLE_LENGTH Records 15-2
15.4 UNDEFINED Records 15-3

Chapter 16. SFDU Usage 16-1
16.1 The ZI SFDU Organization 16-2
16.2 The ZKI SFDU Organization 16-5
16.3 Examples 16-7
16.4 Exceptions to this Standard 16-8

Chapter 17. Usage of N/A, UNK and NULL 17-1
17.1 Interpretation of N/A, UNK, and NULL 17-1

17.1.1 N/A 17-1
17.1.2 UNK 17-1
17.1.3 NULL 17-1
17.2 Implementation Recommendations for N/A, UNK, and NULL 17-2

Chapter 18. Units of Measurement 18-1
18.1 SI Units 18-1

Chapter 19. Volume Organization and Naming 19-1
19.1 Volume Set Types 19-1
19.2 Volume Organization Guidelines 19-2
19.3 Description of Directory Contents and Organization 19-2
19.3.1 ROOT Directory Files 19-2
19.3.2 Required Subdirectories 19-8
19.3.2.1 CATALOG Subdirectory 19-8
19.3.2.2 Data Subdirectory 19-9
19.3.2.3 INDEX Subdirectory 19-10
19.3.3 Optional Subdirectories 19-11
19.3.3.1 CALIBration Subdirectory 19-11
19.3.3.2 DOCUMENT Subdirectory 19-12
19.3.3.3 EXTRAS Subdirectory 19-13
19.3.3.4 GAZETTER Subdirectory 19-13
19.3.3.5 GEOMETRY Subdirectory 19-14
19.3.3.6 LABEL Subdirectory 19-14
19.3.3.7 SOFTWARE Subdirectory 19-14
19.4 Volume Naming 19-16
19.4.1 Volume ID 19-16
19.5 Volume Set Naming 19-17
19.5.1 Volume Set ID 19-17
19.6 Logical Volume Naming 19-18
19.7 Exceptions to This Standard 19-18

Appendix A. PDS Data Object Definitions A-1
A.1 ALIAS A-3
A.2 ARRAY (Primitive Data Object) A-4
A.3 BIT_COLUMN A-8
A.4 BIT ELEMENT (Primitive Data Object) A-11
A.5 CATALOG A-12
A.6 COLLECTION (Primitive Data Object) A-15
A.7 COLUMN A-16
A.8 CONTAINER A-20
A.9 DATA_PRODUCER A-27
A.10 DATA_SUPPLIER A-29
A.11 DIRECTORY A-31
A.12 DOCUMENT A-33
A.13 ELEMENT (Primitive Data Object) A-36

A.14 FIELD A-38
A.15 FILE A-41
A.16 GAZETTEER_TABLE A-45
A.17 HEADER A-55
A.18 HISTOGRAM A-57
A.19 HISTORY A-60
A.20 IMAGE A-64
A.21 INDEX_TABLE A-69
A.22 PALETTE A-74
A.23 QUBE A-77
A.24 SERIES A-85
A.25 SPECTRAL_QUBE A-90
A.26 SPECTRUM A-107
A.27 SPICE KERNEL A-110
A.28 SPREADSHEET A-113
A.29 TABLE A-118
A.30 TEXT A-139
A.31 VOLUME A-141
A.32 WINDOW A-148

Appendix B. Complete PDS Catalog Object Set B-1
B.1 DATA_SET B-4
B.2 DATA_SET_COLL_ASSOC_DATA_SETS B-11
B.3 DATA_SET_COLLECTION_REF_INFO B-12
B.4 DATA_SET_COLLECTION B-13
B.5 DATA_SET_COLLECTION_INFO B-16
B.6 DATA_SET_HOST B-18
B.7 DATA_SET_INFORMATION B-19
B.8 DATA_SET_MAP_PROJECTION B-22
B.9 DATA_SET_MAP_PROJECTION_INFO B-25
B.10 DATA_SET_MISSION B-27
B.11 DATA_SET_REFERENCE_INFORMATION B-28
B.12 DATA_SET_TARGET B-29
B.13 DS_MAP_PROJECTION_REF_INFO B-30
B.14 IMAGE_MAP_PROJECTION B-31
B.15 INSTRUMENT B-36
B.16 INSTRUMENT_HOST B-41
B.17 INSTRUMENT_HOST_INFORMATION B-43
B.18 INSTRUMENT_HOST_REFERENCE_INFO B-44
B.19 INSTRUMENT_INFORMATION B-45
B.20 INSTRUMENT_REFERENCE_INFO B-48
B.21 INVENTORY B-49
B.22 INVENTORY_DATA_SET_INFO B-51
B.23 INVENTORY_NODE_MEDIA_INFO B-52
B.24 MISSION B-53
B.25 MISSION_HOST B-59

B.26 MISSION_INFORMATION B-60
B.27 MISSION_REFERENCE_INFORMATION B-62
B.28 MISSION_TARGET B-63
B.29 PERSONNEL B-64
B.30 PERSONNEL_ELECTRONIC_MAIL B-66
B.31 PERSONNEL_INFORMATION B-67
B.32 REFERENCE B-68
B.33 SOFTWARE B-75
B.34 SOFTWARE_INFORMATION B-77
B.35 SOFTWARE_ONLINE B-78
B.36 SOFTWARE_PURPOSE B-79
B.37 TARGET B-80
B.38 TARGET_INFORMATION B-82
B.39 TARGET_REFERENCE_INFORMATION B-83

Appendix C. Internal Representation of Data Types C-1
C.1 MSB_INTEGER C-2
C.2 MSB_UNSIGNED_INTEGER C-4
C.3 LSB_INTEGER C-6
C.4 LSB_UNSIGNED_INTEGER C-8
C.5 IEEE_REAL C-10
C.6 IEEE_COMPLEX C-13
C.7 PC_REAL C-14
C.8 PC_COMPLEX C-17
C.9 VAX_REAL, VAXG_REAL C-18
C.10 VAX_COMPLEX, VAXG_COMPLEX C-22
C.11 MSB_BIT_STRING C-23
C.12 LSB_BIT_STRING C-25

Appendix D. Examples of Required Files D-1
D.1 AAREADME.TXT D-2
D.2 INDXINFO.TXT D-8
D.3 SOFTINFO.TXT D-9
D.4 VOLDESC.CAT D-13

Appendix E. NAIF Toolkit Directory Structure E-1
E.1 NAIF Directory E-2
E.2 TOOLKIT Directory E-3
E.3 Using the NAIF Toolkit E-12
E.4 NAIF's File Naming Conventions E-13

Appendix F. Acronyms F-1

Appendix G. SAVED Data G-1

G.1 Safekeeping Process and Procedures G-1
G.2 Safekeeping Standards G-1

Appendix H. PDS Data Group Definitions H-1
H.1 BAND_BIN H-3
H.2 BAND_SUFFIX H-4
H.3 LINE_SUFFIX H-5
H.4 PARAMETERS H-6
H.5 SAMPLE_SUFFIX H-7

Appendix I. Data Compression Formats I-1
I.1 CLEM-JPEG I-3
I.2 HUFFMAN FIRST DIFFERENCE I-4
I.3 JPEG 2000 ..... I-5
I.4 PREVIOUS PIXEL I-10
I.5 RUN LENGTH I-11
I.6 ZIP I-12

(This page intentionally left blank.)