

# **PHOENIX ASE EDR/RDR ARCHIVE VOLUME SOFTWARE INTERFACE SPECIFICATION**

v1.0

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**DOCUMENT CHANGE LOG**

<b>Change</b>	<b>Date</b>	<b>Affected Portions</b>
<b>Draft</b>	<b>11/07/07</b>	
<b>Various details added by D. Catling concerning data files and volume structure.</b>	<b>18/01/08</b>	<b>All. Added new subsections: Sec. 2.6 and 2.7.</b>
<b>Changed Fig. 1</b>	<b>22/12/08</b>	<b>Changed Fig. 1</b>

## TBD ITEMS

<b>Section</b>	<b>Description</b>
<b>4.2</b>	<b>Complete delivery schedule section.</b>

## **ACRONYMS AND ABBREVIATIONS**

ASCII	American Standard Code for Information Interchange
ISO	International Standards Organization
JPL	Jet Propulsion Laboratory
NSSDC	National Space Science Data Center
PDS	Planetary Data System
SIS	Software Interface Specification
TBD	To Be Determined

## **1. Introduction**

### **1.1. Purpose and Scope**

This Software Interface Specification is intended to be used by those who wish to understand the format and content of the Phoenix Atmospheric Structure Experiment (ASE) Archive. Typically, these individuals would be software engineers, data analysts, or planetary scientists.

The specifications in this document apply to all ASE standard product archive volumes that are generated by the Phoenix Project.

### **1.2. Content Overview**

The ASE archive includes products from the Entry, Descent & Landing phase of the PHOENIX mission measured by the Atmospheric Structure Experiment. The data products are generated by the Phoenix Science Team's ASE Cognizant Scientist, David Catling, and delivered to the PDS Atmospheres Node at New Mexico State University.

This Software Interface Specification (SIS) describes the format, content, and generation of the ASE Archive. Section 2, Archive Volume Generation, describes the procedure for transferring data products to archive media. Section 3, Archive Volume Contents, describes the structure of the archive volumes and the contents of each file. Section 4, Archive Volume Format, describes the file formats used on the archive volumes. Finally, Section 5, Support Staff and Cognizant Persons, lists the individuals responsible for generating the archive volumes.

### **1.3. Applicable Documents and Constraints**

This Archive Volume SIS is intended to be consistent with the following documents:

1. Mars Exploration Program Data Management Plan, R. E. Arvidson et al., Rev. 3.0, March 20, 2002.
2. Phoenix Project Archive Generation, Validation and Transfer Plan, JPL D-29392, Final, January 17, 2008.
3. ASE EDR and RDRs Software Interface Specification.
4. *Planetary Data System Standards Reference*, March 20, 2006, Version 3.7. JPL D-7669, Part 2.
5. ISO 9660-1988, Information Processing - Volume and File Structure of CD-ROM for Information Exchange, April 15, 1988.

### **1.4. Relationships with Other Interfaces**

This Archive Volume SIS could be affected by changes to the design of the ASE standard data products (Applicable Document #3).

## **2. Archive Volume Contents**

This section describes the contents of the ASE Archive volumes, including the file names, file contents, file types, and organization responsible for providing the files.

## 2.1. Root Directory Contents

Files in the Root Directory include an overview of the archive, a description of the volume for the PDS Catalog, and a list of errata or comments about the archive. The following files are contained in the Root Directory.

File Name	File Contents	File Provided By
AAREADME.TXT	Volume content and format information	Instrument Team
ERRATA.TXT	A cumulative listing of comments and updates concerning all archive volumes published to date	Instrument Team
VOLDESC.CAT	A description of the contents of this volume in a PDS format readable by both humans and computers	PDS Atmospheres Node or Instrument Team

## 2.2. Data Directory Contents and Naming

The Data Directory of the archive volume will contain all of the ASE products. It is subdivided into subdirectories for EDR and RDR products. See Fig. 1 for detail on the directories and files.

## 2.3. Index Directory Contents

Files in the Index Directory are provided to help the user locate products on this archive volume and on previously released volumes in the archive. The following files are contained in the Index Directory.

File Name	File Contents	File Provided By
INDXINFO.TXT	A description of the contents of this directory	Atmospheres Node
INDEX.TAB	A table listing all data products on this volume	Atmospheres Node
INDEX.LBL	A PDS detached label that describes INDEX.TAB	Atmospheres Node

## 2.4. Document Directory Contents

The Document Directory contains documentation to help the user understand and use the archive data. The following files are contained in the Document Directory.

File Name	File Contents	File Provided By
DOCINFO.TXT	A description of the contents of this directory	Atmospheres Node
DPSIS.TXT or .HTM	The Data Product SIS as text or hypertext	Instrument Team
DPSIS.PDF	The Data Product SIS as a PDF file	Instrument Team
DPSIS.LBL	A PDS detached label that describes both DPSIS.TXT(HTM) and DPSIS.PDF	Instrument Team
ARCHSIS.TXT or .HTM	The Archive Volume SIS (this document) as text or hypertext	PDS Atmospheres Node or Instrument Team
ARCHSIS.PDF	The Archive Volume SIS (this document) as a PDF file	PDS Atmospheres Node or Instrument Team



ARCHSIS.LBL	A PDS detached label that describes both ARCHSIS.TXT(HTM) and ARCHSIS.PDF.	PDS Atmospheres Node or Instrument Team
AERO.TXT	Entry probe aerodynamic database description as a text file	Instrument Team
AERO.PDF	Entry probe aerodynamic database description as a PDF file	Instrument Team
AERO.LBL	PDS label file describing AERO.PDF and AERO.TXT	Instrument Team

## 2.5. Catalog Directory Contents

The files in the Catalog Directory provide a top-level understanding of the mission, spacecraft, instruments, and data sets. The files in this directory are coordinated with the PDS data engineer, who is responsible for loading them into the PDS catalog. The following files are found in the Catalog Directory.

File Name	File Contents	File Provided By
CATINFO.TXT	A description of the contents of this directory	Atmospheres Node
DATASET.CAT	Data set information for the PDS catalog	Instrument Team
INSTHOST.CAT	Instrument host (i.e., spacecraft) information for the PDS catalog	Phoenix Project
INST.CAT	Instrument information for the PDS catalog	Instrument Team
MISSION.CAT	Mission information for the PDS catalog	Phoenix Project
PERSON.CAT	Personnel information for the PDS catalog (Team and PDS personnel responsible for generating the archive)	Instrument Team
REF.CAT	References mentioned in other *.CAT files	Instrument Team

## 2.6. CALIB directory contents.

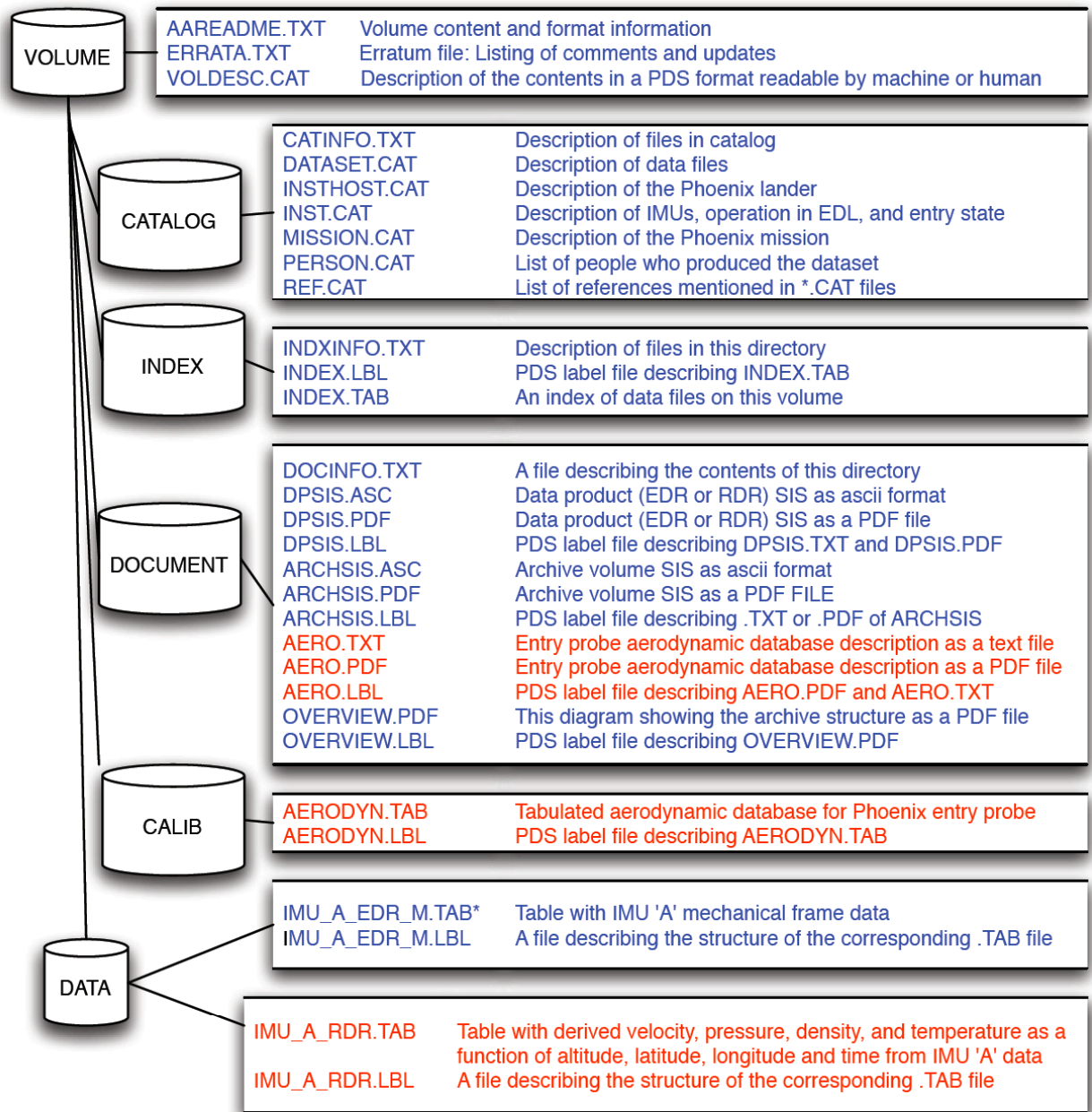
The files in the CALIB directory consist of aerodynamic data that is needed to use the ASE EDR datasets for scientific purposes. The drag on the spacecraft in three dimensions as a function of spacecraft attitude and atmospheric conditions is necessary to reconstruct atmospheric profiles. It is therefore essential that this information be archived.

File Name	File Contents	File Provided By
AERODYN.TAB	Tabulated aerodynamic database for the Phoenix entry probe as a function of spacecraft attitude and atmospheric properties	Phoenix Project to Instrument Team specification
AERODYN.LBL	PDS label file describing AERODYN.TAB	Instrument Team

## 2.7. Overview of the ASE Archive structure

Fig. 1 presents an overview of the Archive volume, directories and files.

**PDS PHOENIX ATMOSPHERIC STRUCTURE EXPERIMENT (ASE) ARCHIVE**



**LEGEND:**

DATA OR TEXT FILES	A DIRECTORY	RED files = provided in the RDR release
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Figure 1: Structure of the ASE archive. Note the legend.

### **3. Archive Volume Format**

This section describes the format of ASE Archive Volumes. Data that comprise the Archive will be formatted in accordance with Planetary Data System specifications [Applicable Document 4].

#### **3.1. Disk Format**

Archive Volumes follow a compact disk format that is compatible with the computer operating systems MS-DOS, Macintosh, and SunOS. The volume format is in accordance with ISO 9660 level 2 Interchange Standard [Applicable Document 5]. Note however that delivery is expected to be electronic from the instrument team to PDS. PDS will assume the responsibility for actually writing the volumes onto hard media such as CDs or DVDs, if at all.

#### **3.2. File Formats**

This section describes file formats for the kinds of files contained on ASE Archive Volumes.

##### **3.2.1. Document File Format**

Document files with the .TXT suffix exist in the Root, Index, Catalog, and Document directories. They are ASCII files which may have embedded PDS labels. Lines in a .TXT file end with a carriage return character (ASCII 13) and a line feed character (ASCII 10). This allows the files to be readable under various operating systems.

Documents in the Document directory may contain formatting and figures that cannot be rendered as ASCII text. Therefore each document is given in two formats, either hypertext or plain ASCII, and PDF. The hypertext file contains ASCII text plus hypertext markup language (HTML) commands that enable it to be viewed in a Web browser such as Netscape Navigator or Microsoft Internet Explorer. The hypertext file may be accompanied by ancillary files such as images and style sheets that are incorporated into the document by the Web browser. The second format, PDF (Portable Document Format) is a proprietary format of Adobe Systems Incorporated that is frequently used for distributing documents. Adobe offers free software, Acrobat Reader, for viewing PDF files.

##### **3.2.2. Tabular File Format**

Tabular files (.TAB suffix) exist in the Index and Data directories. Tabular files are ASCII files formatted for direct reading into many database management systems on various computers. All fields are separated by commas, and character fields are enclosed in double quotation marks ("). (Character fields are padded with spaces to keep quotation marks in the same columns of successive records.) Character fields are left justified, and numeric fields are right justified. The "start byte" and "bytes" values listed in the labels do not include the commas between fields or the quotation marks surrounding character fields. The records are of fixed length, and the last two bytes of each record contain the ASCII carriage return and line feed characters. This allows a table to be treated as a fixed length record file on computers that support this file type and as a text file with embedded line delimiters on those that don't.

All tabular files are described by PDS labels, either embedded at the beginning of the file or detached. If detached, the PDS label file has the same name as the data file it describes, with the extension .LBL; for example, the file INDEX.TAB is accompanied by the detached label file INDEX.LBL in the same directory.

### 3.2.3. PDS Label Format

All data files in the archive have PDS labels, either embedded at the beginning of the file or detached in a separate file. For examples of PDS labels for each type of data product, see the Data Product SIS [Applicable Document 3].

A PDS label, whether embedded or detached from its associated file, provides descriptive information about the associated file. The PDS label is an object-oriented structure consisting of sets of 'keyword=value' declarations. The object to which the label refers (e.g. IMAGE, TABLE, etc.) is denoted by a statement of the form:

```
^object = location
```

in which the carat character (^, also called a pointer in this context) indicates where to find the object. In an embedded label, the location is an integer representing the starting record number of the object (the first record in the file is record 1). In a detached label, the location denotes the name of the file containing the object, along with the starting record or byte number, if there is more than one object in the file. For example:

```
^HEADER = ("F01.IMG",1)
^IMAGE = ("F01.IMG",1025 <BYTES>)
```

indicates that the IMAGE object begins at byte 1025 of the file F01.IMG, in the same directory as the detached label file. Below is a list of the possible formats for the ^object definition.

```
^object      = n
^object      = n<BYTES>
^object      = "filename.ext"
^object      = ("filename.ext",n)
^object      = ("[dirlist]filename.ext",n)
^object      = ("filename.ext",n<BYTES>)
^object      = ("[dirlist]filename.ext",n<BYTES>)
```

where

**n** is the starting record or byte number of the object, counting from the beginning of the file (record 1, byte 1),

**<BYTES>** indicates that the number given is in units of bytes,

**filename** is the up to 8 character, alphanumeric upper-case file name,

**ext** is the 3 character upper-case file extension,

**dirlist** is a period-delimited path-list of parent directories, in upper case, that specifies the object file directory (used only when the object is not in the same directory as the label file). The list begins at the directory level below the root directory of the CD-ROM. '[dirlist]' may be omitted when the object being described is located either in the same directory as the detached label, or in a subdirectory named LABEL that is located in a higher level of the directory tree, typically the CD-ROM root itself.

Lines of text in detached labels end with a carriage return character (ASCII 13) and a line feed character (ASCII 10). This allows the files to be readable under various operating systems.

#### 3.2.4. Catalog File Format

Catalog files (suffix .CAT) exist in the Root and Catalog directories. They are text files formatted in an object-oriented structure consisting of sets of 'keyword=value' declarations.

#### 3.2.5. Science Data File Formats

The ASE data files are ASCII tables. See the above section on Tabular File Format for a more complete description. For more information about the format and content of the data products, see the Data Product SISs [Applicable Document 3].

## 4. Archive Volume Generation

### 4.1. Data Transfer and Validation Methods

ASE products are generated by the ASE Cognizant Scientist, David Catling, at the University of Washington/University of Bristol. The products will be delivered electronically (FTP or other means) to the PDS Atmospheres Node at New Mexico State University according to the Phoenix Project delivery schedule. Assembly of the volumes will be done either by the Atmospheres Node.

The ASE team validates the data products for science content as part of the product generation process. The Atmospheres Node validates the data products and ancillary files for compliance with PDS standards and with the SISs.

The volumes will then be made available via Internet and FTP access at the Atmospheres Node.

The Atmospheres Node is responsible for delivering copies of the volumes to the NSSDC and to the PDS Engineering Node (as the backup site for the Atmospheres Node).

### 4.2. Data Product Sizes and Delivery Rates

Table 1 summarizes expected sizes and production rates for the ASE Standard Products.

*Table 1: Standard Product Sizes and Delivery Rates*

Product	Product Size	Production Rate	Expected Number of Products for Primary Mission (TBD days)	Expected Total Data Volume for Primary Mission
EDR products	TBD	TBD		
RDR products	TBD	TBD		

According to the Phoenix Archive Plan, delivery of data to the PDS occurs ~Dec 11, 2008 for a scheduled first public data release on Dec 25, 2008. For the ASE, EDR products will be delivered at this time.

Manpower permitting, a second delivery of data occurs Feb 12, 2009. At this time, RDR products and associated aerodynamic files in the CALIB directory and DOCUMENT directory will be delivered to complete the volume.

#### Interface Media Characteristics

All volumes in the ASE Standard Product Archive conform to ISO 9660 standards [Applicable Document 5].

### 4.3. Backup and Duplicates

Backup copies of ASE products are the responsibility of the instrument team until the volumes have been validated by the Atmospheres Node. Duplicate copies of ASE archive volumes will be housed at the PDS Engineering Node and at NSSDC.

#### **4.4. Labeling and Identification**

Each ASE archive volume will be identified by a unique volume ID formed according to the scheme PHX-M-ASE-2-EDL-V1.0, where:

PHX represents the Phoenix mission, and

ASE represents the ASE instrument.

#### **5. Support Staff and Cognizant Persons**

David Catling, ASE Principal Investigator, University of Washington.

Lyle Huber, PDS Atmospheres Node, New Mexico State University

Jim Murphy, PDS Atmospheres Node, New Mexico State University

Questions and comments regarding the ASE Archive Volume may be directed to the PDS Atmospheres Node, lhuber <at> nmsu.edu, 505-646-1862.