

Lunar Reconnaissance Orbiter Project
LYMAN ALPHA MAPPING PROJECT
EXPERIMENT DATA RECORD (EDR)
ARCHIVE VOLUME
SOFTWARE INTERFACE SPECIFICATION

March 2009

SwRI® Project 11239

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Contract NNG05EC87C

Prepared by

David E. Kaufmann



SOUTHWEST RESEARCH INSTITUTE®

Space Science and Engineering Division
6220 Culebra Road, San Antonio, Texas 78228-0510
(210) 684-5111 • FAX (210) 647-4325

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03 March 2009

Approved by: _____ Date: _____
Maarten Versteeg, (SwRI) LAMP Software Lead

Approved by: _____ Date: _____
Rafael Alanis, (JPL) PDS Imaging Node

Approved by: _____ Date: _____
Sue Lavoie, (JPL) PDS Imaging Node Co-Manager

Approved by: _____ Date: _____
Stan Scott, (GSFC) LRO Science Data Manager

Approved by: _____ Date: _____
Edwin Grayzeck, (GSFC) PDS Program Manager

Approved by: _____ Date: _____
Joel Parker, (SwRI) LAMP SOC & Archive Manager

Approved by: _____ Date: _____
Randy Gladstone, (SwRI) Acting LAMP PI

Approved by: _____ Date: _____
Joerg Gerhardus, (SwRI) Quality Assurance

Approved by: _____ Date: _____
Sarah Hodgson, (SwRI) Project CM

Space Science and Engineering Division
Southwest Research Institute
P. O. Drawer 28510
6220 Culebra Road
San Antonio, Texas 78228-0510
(210) 684-5111

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REVISION NOTICE

Change	Date	Affected Portions
Initial draft	16 April 2007	
Draft 2	01 June 2007	Updated draft, incorporating comments from Stan Scott and Karen North Section 1.2, Content Overview (clarified roles of the LAMP Team versus PDS in assembling LAMP EDR archive volumes; also updated "File Provided By" entries in tables in Sections 2.3-2.8, 2.10-2.11) Section 3.2.3, PDS Label Format (removed references to embedded PDS labels since all LAMP PDS labels will be detached) Section 4.5, Labeling and Identification (changed LAMP EDR Volume Set ID to USA_NASA_PDS_LROLMP_10xx, and modified surrounding explanatory text)
Draft 3	11 June 2007	Updated LAMP EDR Volume Set ID to reflect Susan Slavney's recommendation documented on the LRO Archive Development web page (http://wufs.wustl.edu/missions/lro/). Section 4.5, Labeling and Identification (changed LAMP EDR Volume Set ID to USA_NASA_PDS_LROLAM_0XXX, and modified surrounding explanatory text)
Draft 4	05 August 2007	Updated draft, incorporating comments from Rafael Alanis Signature page added Section 2.2, Archive Volume Directories (removed reference to LABEL subdirectory, which we now do not foresee using) Section 2.8, LABEL Directory Contents (modified to reflect the fact that we now do not foresee using this directory)
Draft 5	15 February 2008	Updated draft, incorporating comments from the SIS reviewers Miscellaneous small corrections and additions
Draft 6	24 February 2008	Updated Ed Grayzeck's location per Stan Scott's email; also updated GEOMETRY directory contents file naming according to latest version of 431-ICD-000049 (NAIF product naming convention still unspecified in this document, however) Signature page; Section 2.11 GEOMETRY Directory Contents
Draft 7	15 December 2008	Removed remaining TBD/TBS items Title page; Sections 1.3, 2.11, and 2.13
Draft 8	02 February 2009	Added clarifying text; reformatted
Draft 9	09 February 2009	Clarified SCUT time stamp in EDR filename to refer to the start of the file rather than the start of the first data acquisition in the file Section 2.4
Initial Release R0	03 March 2009	Modified text to say each delivered volume will contain all ancillary files, and thus be "self-contained." Added explicit mention of PDS labels to accompany data files. Sections 1.2, 2.10, and 2.11

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 LRO LAMP EDR Archive. Typically, these individuals would be software engineers, data analysts, or planetary scientists.

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

1.2 Content Overview

This Software Interface Specification (SIS) describes the format, content, and generation of the LAMP EDR 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.

The sources of the data contained in the LAMP EDR data product are files received from the LRO MOC containing, respectively, the LAMP instrument low-speed housekeeping telemetry and the LAMP science data. These files are delivered to the LAMP SOC on a nominal basis of one file of each type per orbit. The LAMP EDR data product, generated by code nicknamed “Lima,” combines these file pairs, also on a one file per orbit basis, and contains the following seven types of data:

1. Spectral Image (Aperture Door Open)
2. Spectral Image (Aperture Door Closed)
3. Acquisition List
4. Raw Frame Data
5. Calculated Count Rate
6. LTS Data
7. Housekeeping Data

The EDR data products are generated by the LAMP Science Team at the Southwest Research Institute in Boulder, Colorado, and delivered to the PDS Imaging Node at the Jet Propulsion Laboratory in Pasadena, California. The LAMP Team is responsible for assembling and validating PDS-compliant LAMP archive volumes. The LAMP Team will deliver DVD-sized archive volumes on DVD-R media to the Imaging Node according to the schedule listed in [7]. The delivery of the complete EDR archive to PDS will occur incrementally, every 3 months, starting at launch + 8 months. Thus the LAMP EDR archive data set will be built up over time via multiple volume deliveries. Each delivered volume will contain not only the EDR data in the DATA subdirectory (see Section 2 of this document) but also all of the other required files (e.g., in subdirectories such as INDEX, DOCUMENT, CATALOG, CALIB, GEOMETRY, etc.). Thus, in this sense, each delivered volume will constitute a “completely assembled” LAMP archive volume. The complete LAMP EDR archive, then, will consist of the totality of these delivered volumes.

1.3 Applicable Documents and Constraints

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

1. Lunar Reconnaissance Orbiter Data Management and Archive Plan, 431-PLAN-000182.
2. Lyman Alpha Mapping Project Experiment Data Record (EDR) Data Product Software Interface Specification, 11239-EDRDP_SIS-01.
3. *Planetary Data System Archive Preparation Guide*, August 29, 2006, Version 1.1, JPL D-31224.
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.
6. Definition of the Flexible Image Transport System (FITS), version 2.1b, December 9, 2005, IAU FITS Working Group (<http://fits.gsfc.nasa.gov/iaufwg/>).
7. LRO-LAMP Instrument Team Data Management and Archive Plan, 11239-DMAP-01.
8. LAMP Science Team and PDS Imaging Node Interface Control Document, JPL D-49057.

1.4 Relationships with Other Interfaces

This Archive Volume SIS could be affected by changes to the design of the LAMP EDR standard data products [2].

2. ARCHIVE VOLUME CONTENTS

This section describes the contents of the LAMP EDR Archive volumes, including the file names, file contents, file types, and organization responsible for providing the files (i.e., the LAMP Science Team, the LRO Project, or the PDS Imaging Node).

2.1 Online and Physical Storage

The LAMP EDR archive will be made available through the Planetary Data System via online Internet access and via physical media such as DVDs. The PDS will store at least three copies of the LAMP EDR archive on physical media for long-term preservation.

The following description of the contents of a LAMP EDR archive volume applies to both physical volumes and online storage. The online LAMP EDR archive will be organized as one large volume. The PDS Imaging Node will be responsible for merging the contents of the individual archive volumes delivered by the LAMP Team into the single online archive volume.

2.2 Archive Volume Directories

LAMP EDR archive volumes include the following directories.

Directory	Contents
Volume root directory	Introduction and errata text files
CALIB	Calibration files needed to use the data
CATALOG	Descriptions of data set, instrument, spacecraft, and mission as found in the PDS Catalog

Directory	Contents
DATA	Entry point to subdirectories containing the actual LAMP EDR data files and their detached PDS labels
DOCUMENT	Documentation files
GEOMETRY	SPICE kernels describing the observational geometry
INDEX	Volume and cumulative index tables

The contents of these directories are described in detail below.

2.3 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	LAMP Science Team
ERRATA.TXT	A cumulative listing of comments and updates concerning all archive volumes published to date	LAMP Science Team
VOLDESC.CAT	A description of the contents of this volume in a PDS format readable by both humans and computers	LAMP Science Team

2.4 DATA Directory Contents and Naming

In the DATA directory of the LAMP EDR archive, data product files with detached PDS label files are arranged in a logical subdirectory structure with subdirectories named in the format YYYYDDD, corresponding to the year and day of year for the date of the start of data acquisition, e.g., DATA/2008305/. Normally, each LAMP EDR data product will contain observational data taken during a single LRO orbit. Thus, using a value of 113 minutes for the orbital period of LRO, LAMP will generate approximately 13 data product files per day.

There is only one type of LAMP EDR data product, a FITS format file that contains seven types of data derived from the raw LAMP science and housekeeping data files received from the instrument via the LRO MOC. The internal layout of these data within each FITS file is documented in the LAMP EDR Data Product SIS [2]. The naming convention for LAMP EDR data product files is LAMP_ENG_nnnnnnnnnn_vv.FIT. The ten-digit nnnnnnnnnn value will be a time stamp value, namely the Spacecraft UT (SCUT) of the start of the file. The two-digit vv value will be a version number to facilitate unique identification of (possibly reprocessed) EDR data files. The .FIT extension indicates the FITS format. Each EDR data product file will have a detached PDS label in a separate file of the same name, but with extension .LBL.

The table below shows the contents of a typical data subdirectory, containing data for one day.

File Name	File Contents	File Provided By
LAMP_ENG_0001296000_00.FIT, .LBL	Raw LAMP science and HK data + PDS label	LAMP Science Team
LAMP_ENG_0001302780_00.FIT, .LBL	Raw LAMP science and HK data + PDS label	LAMP Science Team
...	...	...
LAMP_ENG_0001377360_00.FIT, .LBL	Raw LAMP science and HK data + PDS label	LAMP Science Team

2.5 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	LAMP Science Team
INDEX.TAB	A table listing all data products on this volume	LAMP Science Team
INDEX.LBL	A PDS detached label that describes INDEX.TAB	LAMP Science Team
CUMINDEX.TAB	A cumulative listing of all data products on this volume and on previous volumes in this set	LAMP Science Team
CUMINDEX.LBL	A PDS detached label that describes CUMINDEX.TAB	LAMP Science Team

2.6 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	LAMP Science Team
DPSIS.TXT	The LAMP EDR Data Product SIS as text	LAMP Science Team
DPSIS.PDF	The LAMP EDR Data Product SIS as a PDF file	LAMP Science Team
DPSIS.LBL	A PDS detached label that describes both DPSIS.TXT and DPSIS.PDF	LAMP Science Team
ARCHSIS.TXT	The LAMP EDR Archive Volume SIS (this document) as text	LAMP Science Team
ARCHSIS.PDF	The LAMP EDR Archive Volume SIS (this document) as a PDF file	LAMP Science Team
ARCHSIS.LBL	A PDS detached label that describes both ARCHSIS.TXT and ARCHSIS.PDF.	LAMP Science Team
LAMP_INSTRUMENT_SUM.PDF	Software user's manual for the LRO-LAMP instrument, as a PDF file	LAMP Science Team
LAMP_INSTRUMENT_SUM.LBL	A PDS detached label that describes LAMP_INSTRUMENT_SUM.PDF	LAMP Science Team
LAMP_SOC_PIPELINE_SUM.PDF	Software user's manual for the LAMP SOC data processing pipeline software, as a PDF file	LAMP Science Team
LAMP_SOC_PIPELINE_SUM.LBL	A PDS detached label that describes LAMP_SOC_PIPELINE_SUM.PDF	LAMP Science Team
LAMP_LIMA_C_SOURCE.TXT	An ASCII text listing of the C source code for the Lima element of the LAMP SOC data processing pipeline. Lima creates the EDR data product from the raw instrument files received from the MOC	LAMP Science Team
LAMP_MIKE_IDL_SOURCE.TXT	An ASCII text listing of the IDL source code for the Mike element of the LAMP SOC data processing pipeline. Mike calibrates the EDR data product produced by Lima.	LAMP Science Team

In the last two table items above, the terms "Lima" and "Mike" are not intended to convey any extra

information in and of themselves. The LAMP team simply calls the CODMAC Level 2 and 3 pipeline processing software "Lima" and "Mike" for historical reasons, as they have a history with similar instruments on the Rosetta and New Horizons missions.

2.7 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	LAMP Science Team
DATASET.CAT	Data set information for the PDS catalog	LAMP Science Team
INSTHOST.CAT	Instrument host (i.e., spacecraft) information for the PDS catalog	LRO Project
INST.CAT	Instrument information for the PDS catalog	LAMP Science Team
MISSION.CAT	Mission information for the PDS catalog	LRO Project
PERSON.CAT	Personnel information for the PDS catalog (Team and PDS personnel responsible for generating the archive)	LAMP Science Team
REF.CAT	References mentioned in other *.CAT files	LAMP Science Team

2.8 LABEL Directory Contents

It is not anticipated at this time that the LABEL directory will be used in the LAMP EDR archive volume.

2.9 SOFTWARE Directory Contents

The LAMP Science Team does not foresee providing any software that is intended for regular updates and multiple platform capability. The source code of relevant software used internally by the LAMP Science Team (LAMP_LIMA_C_SOURCE.TXT, LAMP_MIKE_IDL_SOURCE.TXT) will be provided as reference documents in the DOCUMENT directory (see Section 2.6). This software is provided for the purpose of documentation only, and is not supported.

2.10 CALIB Directory Contents

The CALIB directory contains calibration files used to process the data products, or calibration data needed to use the data products. The following files are contained in the CALIB directory.

File Name	File Contents	File Provided By
CALINFO.TXT	A description of the contents of this directory	LAMP Science Team
LAMP_FLAT_nnn.FIT, .LBL	Flat field calibration image + PDS label, nnn = version #	LAMP Science Team
LAMP_DARK_nnn.FIT, .LBL	Dark calibration image + PDS label, nnn = version #	LAMP Science Team
LAMP_DEAD_nnn.TXT, .LBL	Deadtime correction, either lookup table or IDL function source, + PDS label, nnn = version #	LAMP Science Team
LAMP_WCAL_nnn.TXT, .LBL	Wavelength calibration, either lookup table or IDL function source, + PDS label, nnn = version #	LAMP Science Team

File Name	File Contents	File Provided By
LAMP_AEFF_nnn.TXT, .LBL	Effective area calibration, IDL function source, + PDS label, nnn = version #	LAMP Science Team

2.11 GEOMETRY Directory Contents

The GEOMETRY directory contains files needed to understand observation geometry. The following files are contained in the GEOMETRY directory.

File Name	File Contents	File Provided By
GEOMINFO.TXT	A description of the contents of this directory	LAMP Science Team
FDF29_yyyyddd_yyyyddd_fnn.bsp, .lbl	LRO definitive SPICE SPK (spacecraft and planet ephemeris) file + PDS label	LRO Project (MOC)
pck00008.tpc, .lbl	SPICE generic PCK (planetary constants) file + PDS label	LRO Project (MOC)
moon_pa_de421_1900-2050.bpc, .lbl	SPICE binary PCK (high-precision lunar orientation) file + PDS label	LRO Project (MOC)
MOC42_yyyyddd_yyyyddd_fnn.bc, .lbl	SPICE definitive CK (S/C orientation) file + PDS label	LRO Project (MOC)
LRO_CLKCOR_yyyyddd_Vnn.tcs, .lbl	SPICE SCLK (clock correlation) file + PDS label, nn = version #	LRO Project (MOC)
LRO_FRAMES_yyyyddd_Vnn.txt, .lbl	SPICE FK (reference frame) file + PDS label, nn = version #	LRO Project (MOC)
naif0009.tls, .lbl	SPICE LSK (leapsecond information) file + PDS label	LRO Project (MOC)
de421.bsp, .lbl	SPICE planetary SPK + PDS label	LRO Project (MOC)
moon_080317.tf, .lbl	SPICE lunar frames kernel + PDS label	LRO Project (MOC)
moon_assoc_me.tf, .lbl	SPICE lunar body-fixed frame association kernel + PDS label	LRO Project (MOC)
LRO_LAMP_yyyyddd_Vnn.ti, .lbl	SPICE IK (instrument) file + PDS label	LAMP Science Team

2.12 BROWSE Directory Contents

The BROWSE directory will not be used in the LAMP EDR archive volume.

2.13 EXTRAS Directory Contents

It is not anticipated at this time that the EXTRAS directory will be used in the LAMP EDR archive volume.

2.14 GAZETTER Directory Contents

The GAZETTER directory will not be used in the LAMP EDR archive volume.

3. ARCHIVE VOLUME FORMAT

This section describes the format of LAMP EDR Archive Volumes. Data that comprise the Archive will be formatted in accordance with Planetary Data System specifications [3,4].

3.1 Disk Format

Archive Volumes have a 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 [5].

3.2 File Formats

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

3.2.1 Document File Format

Document files with the .TXT suffix exist in the root, INDEX, DOCUMENT, CATALOG, CALIB, and GEOMETRY directories. They are ASCII files that 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 one or both of two formats, hypertext 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, which 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 directory. 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 do not.

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 detached PDS labels that are contained in separate files. For an example of a PDS label corresponding to a LAMP EDR data product, see the Data Product SIS [2].

A PDS label consists of lines of ASCII text in the form of keyword = value statements that provide descriptive information about the data file. The label is intended to be readable both by humans and by software. Details of the syntax and semantics of PDS labels can be found in the PDS Standards Reference [4], and definitions of the keywords used in the label can be found by using the PDS Data

Dictionary Lookup web service at http://pds.jpl.nasa.gov/tools/data_dictionary_lookup.cfm.

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 read under various operating systems.

3.2.4 Software File Format

As stated previously, the LAMP Science Team does not foresee providing any software that is intended for regular updates and multiple platform capability. The source code of relevant software used internally by the LAMP Science Team will be provided as reference documents in the DOCUMENT directory. This software is provided for the purpose of documentation only, and is not supported. That said, the IDL source code should execute normally under IDL Version 6.3 or later, and the C source code should compile using any standard C compiler that supports ANSI C.

3.2.5 Catalog File Format

Catalog files (suffix .CAT) exist in the root and CATALOG directories. Like PDS labels, they are text files formatted as keyword = value statements. They contain descriptions of the data set, instrument, spacecraft, and mission, as well as personnel contact information and references to published literature. They are called Catalog Files because they are loaded into the PDS online catalog to make the information available to users searching for data.

3.2.6 Science Data File Formats

LAMP EDR data files are all in the form of FITS files that adhere to the FITS Standard, Version 2.1b [6]. Each file contains seven types of data, one in the primary FITS HDU (Extension 0) and the remaining six in FITS Extensions 1-6. The first two FITS HDUs contain spectral image data, the third a FITS ASCII table, and the rest contain FITS binary tables. Each EDR data file normally contains data from a single "observation." During nominal nadir-pointed LRO operations, a single observation generally refers to data taken during a single LRO orbit.

For more information about the format and content of the data products, see the Data Product SIS [2].

4. ARCHIVE VOLUME GENERATION

4.1 Data Transfer and Validation Methods

The LAMP Science Team will generate the LAMP EDR data products at the Southwest Research Institute in Boulder, Colorado. In addition, the LAMP Science Team will assemble the data products into EDR archive volumes and deliver DVD-R copies of these volumes to the PDS Imaging Node at the Jet Propulsion Laboratory in Pasadena, California, according to the schedule in Section 4.2.

The LAMP Science Team will validate the EDR products for science content as part of the product generation process. The Imaging Node will validate the EDR products and the completed archive volumes for compliance with PDS standards and with the EDR Data Product and Archive Volume SIS documents.

The Imaging Node will make the LAMP EDR archive volumes available via Internet web access and FTP access. The Imaging Node will also make copies of the LAMP EDR archive available for long-term storage at the National Space Science Data Center (NSSDC) according to agreements between PDS and NSSDC.

More information can be found in the LRO-LAMP Instrument Team Data Management and Archive Plan [7] and the LAMP Science Team and PDS Imaging Node Interface Control Document [8].

4.2 Data Product Sizes and Delivery Rates

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

Table 1 – Standard Product Sizes and Delivery Rates

Product	Product Size	Production Rate (# product files)	Expected Number of Products for Primary Mission (365 days)	Expected Total Data Volume for Primary Mission
LAMP EDR	21.5 MB	12.75 per day (on average)	4654	100 GB

The LAMP Science Team will release EDR data product archives to the PDS Imaging Node according to the schedule outlined in the Lunar Reconnaissance Orbiter Data Management and Archive Plan [1] and the LRO-LAMP Instrument Team Data Management and Archive Plan [7]. In accordance with the Lunar Reconnaissance Orbiter Project data release policy, a six-month period after data acquisition is allotted for product generation and validation. The first LAMP EDR data release is scheduled for launch + 8 months (i.e., completion of commissioning + 6 months). Thereafter, data releases will occur every three months.

4.3 Interface Media Characteristics

All volumes in the LAMP EDR Standard Product Archive conform to ISO 9660 standards [ISO 9660, 1988].

4.4 Backup and Duplicates

Backup copies of the LAMP EDR data products and archive volumes will be stored at the Southwest Research Institute in Boulder, Colorado, until physical media containing archives of the final versions of the products have been received and validated by the PDS Imaging Node.

Duplicate copies of the LAMP EDR archive volumes on physical media will be stored at the PDS Imaging Node and the NSSDC.

4.5 Labeling and Identification

The LAMP EDR archive volume will be identified by a unique volume ID formed according to the scheme LROLAM_0XXX, where:

- LRO represents the Lunar Reconnaissance Orbiter mission,
- LAM represents the LAMP instrument,
- 0 indicates the EDR volume set, and
- XXX is used for online volumes and is replaced by a sequence number when data are written to physical media.

If a volume is redone because of errors in the initial production, or if the entire LAMP EDR data set is revised and the data set ID version number is incremented, then the archive volume version will also be incremented. This parameter, VOLUME_VERSION_ID, is contained in the VOLDESC.CAT file on the

volume. Using the above scheme for forming the LAMP EDR archive volume ID, then, the corresponding archive volume set ID would be USA_NASA_PDS_LROLAM_0XXX.

5. SUPPORT STAFF AND COGNIZANT PERSONS

Randy Gladstone, LAMP Principal Investigator (acting), Southwest Research Institute

Rafael Alanis, PDS Imaging Node, Jet Propulsion Laboratory

Joel Parker, LAMP SOC & Archive Manager, Southwest Research Institute

David Kaufmann, LAMP SOC & Archive Engineer, Southwest Research Institute

Maarten Versteeg, LAMP Software Lead, Southwest Research Institute

Kurt Retherford, LAMP Data Scientist, Southwest Research Institute

Ronald Black, LAMP Project Manager, Southwest Research Institute

Questions and comments regarding the LAMP EDR Archive Volume may be directed to the PDS Imaging Node, Jet Propulsion Laboratory, via their web-based feedback form at URL <http://pds-imaging.jpl.nasa.gov/pds-form.html>.

APPENDIX A – GLOSSARY

Archive – An archive consists of one or more data sets along with all the documentation and ancillary information needed to understand and use the data. An archive is a logical construct independent of the medium on which it is stored.

Archive Volume, Archive Volume Set – A volume is a unit of media on which data products are stored; for example, one CD-ROM or DVD-ROM. An *archive volume* is a volume containing all or part of an archive; that is, data products plus documentation and ancillary files. When an archive spans multiple volumes, they are called an *archive volume set*. Usually the documentation and some ancillary files are repeated on each volume of the set, so that a single volume can be used alone.

Catalog Information – Descriptive information about a data set (e.g. mission description, spacecraft description, instrument description), expressed in Object Description Language (ODL) which is suitable for loading into a PDS catalog.

Data Product – A labeled grouping of data resulting from a scientific observation, usually stored in one file. A product label identifies, describes, and defines the structure of the data. An example of a data product is a planetary image, a spectrum table, or a time series table.

Data Set – An accumulation of data products. A data set together with supporting documentation and ancillary files is an archive.

Standard Data Product – A data product generated in a predefined way using well-understood procedures, processed in "pipeline" fashion. Data products that are generated in a nonstandard way are sometimes called *special data products*.

APPENDIX B – ACRONYMS AND ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
C&DH	Command and Data Handling
CD-ROM	Compact Disk - Read-Only Memory
CD-WO	Write-Once Compact Disk
CODMAC	Committee on Data Management, Archiving and Computing
DVD-ROM	Digital Video Disk – Read-Only Memory
EDR	Experiment Data Record
FITS	Flexible Image Transport System
HDU	Header and Data Unit (FITS)
HK	Housekeeping
HVPS	High-Voltage Power Supply
HW	Hardware
IAU	International Astronomical Union
ICD	Interface Control Document
IDL	Interactive Data Language
ISO	International Standards Organization
JPL	Jet Propulsion Laboratory
LAMP	Lyman Alpha Mapping Project
LRO	Lunar Reconnaissance Orbiter
LTS	Lunar Terminator Sensor
MCP	Microchannel Plate
MOC	Mission Operations Center
NAIF	Navigation and Ancillary Information Facility
NASA	National Aeronautics and Space Administration
NSSDC	National Space Science Data Center
PDS	Planetary Data System
PSG	Project Science Group
SCLK	Spacecraft Clock (SPICE kernel)
SCUT	Spacecraft Universal Time
SDVT	Science Data Validation Team
SIS	Software Interface Specification
SOC	Science Operations Center
SPICE	Spacecraft, Planet, Instrument, C-matrix (pointing), and Events
TBD	To Be Determined
TBS	To Be Supplied
UTC	Coordinated Universal Time
UV	Ultraviolet

APPENDIX C – NASA AND CODMAC DATA LEVEL DEFINITIONS

NASA	CODMAC	Description
Packet data	Raw - Level 1	Telemetry data stream as received at the ground station, with science and engineering data embedded.
Level 0	Edited - Level 2	Instrument science data (e.g., raw voltages, counts) at full resolution, time ordered, with duplicates and transmission errors removed.
Level 1A	Calibrated - Level 3	NASA Level 0 data that have been located in space and may have been transformed (e.g., calibrated, rearranged) in a reversible manner and packaged with needed ancillary and auxiliary data (e.g., radiances with the calibration equations applied).
Level 1B	Resampled - Level 4	Irreversibly transformed (e.g., resampled, remapped, calibrated) values of the instrument measurements (e.g., radiances, magnetic field strength).
Level 1C	Derived - Level 5	NASA Level 1A or 1B data that have been resampled and mapped onto uniform space-time grids. The data are calibrated (i.e., radiometrically corrected) and may have additional corrections applied (e.g., terrain correction).
Level 2	Derived - Level 5	Geophysical parameters, generally derived from Level 1 data, and located in space and time commensurate with instrument location, pointing, and sampling.
Level 3	Derived - Level 5	Geophysical parameters mapped onto uniform space-time grids.