

Mars Reconnaissance Orbiter

**GRAVITY AND RADIO SCIENCE
REDUCED DATA
ARCHIVE VOLUME SOFTWARE
INTERFACE SPECIFICATION**

(GRAVITY/RS RDR ARCHIVE VOLUME SIS)

**Version 1.0
July 28, 2008**

Prepared by:

Susan Slavney
PDS Geosciences Node

Approved by:

Maria Zuber
Principal Investigator, Gravity / Radio Science

Raymond E. Arvidson
Director, PDS Geosciences Node

DOCUMENT CHANGE LOG

Date	Description	Sections affected

TBD ITEMS

Section	Description

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ACRONYMS AND ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
CD-ROM	Compact Disk - Read-Only Memory
CD-WO	Write-Once Compact Disk
ISO	International Standards Organization
JPL	Jet Propulsion Laboratory
NSSDC	National Space Science Data Center
PDS	Planetary Data System
PSG	Project Science Group
SDVT	Science Data Validation Team
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 MRO Gravity / Radio Science Reduced Data Record (RDR) Archive. Typically, these individuals would be software engineers, data analysts, or planetary scientists.

The specifications in this document apply to all Gravity/RS RDR standard product archive volumes that are generated by the MRO Project.

1.2. Content Overview

This archive contains the following data products derived from raw MRO Gravity / Radio Science data.

- Gravity field model coefficients
- Gravity field model error covariance matrices
- Gravity field areoid and gravity anomaly maps

The data are generated, assembled into archive volumes, and delivered to the PDS Geosciences Node by the MRO Radio Science Investigation Team.

This Software Interface Specification (SIS) describes the format, content, and generation of the MRO Gravity / Radio Science RDR Archive.

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. Mars Reconnaissance Orbiter (MRO) Project Data Archive Generation, Validation, and Transfer Plan, R.E. Arvidson et al., JPL D-22246.
3. Spherical Harmonics ASCII Data Record (SHADR) Software Interface Specification, F. Lemoine, Version 1.0, February 20, 2006.
4. Spherical Harmonics Binary Data Record (SHBDR) Software Interface Specification, F. Lemoine, Version 1.0, February 15, 2006.
5. Radio Science Digital Map (RSDMAP) Products Software Interface Specification, F. Lemoine, Version 1.0, February 21, 2006.
6. Planetary Data System Archive Preparation Guide (APG), R. Beebe, January 20, 2005.
7. Planetary Data System Standards Reference, March 20, 2006, Version 3.7, JPL D-7669, Part 2.
8. 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 reduced Gravity / Radio Science standard data products (Applicable Documents 3, 4, and 5).

2. Archive Volume Contents

This section describes the contents of the Gravity / RS RDR 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	Geosciences Node
ERRATA.TXT	A cumulative listing of comments and updates concerning all archive volumes published to date	Gravity/RS Team
VOLDESC.CAT	A description of the contents of this volume in a PDS format readable by both humans and computers	Geosciences Node

2.2. Data Directory Contents and Naming

Under the Data Directory are three subdirectories named SHADR, SHBDR, and RSDMAP, which store the Spherical Harmonics ASCII Data Record, Spherical Harmonics Binary Data Record, and Radio Science Digital Map data. The following files are contained in these subdirectories. See applicable documents 3, 4, and 5 for explanations of the naming conventions.

File Name	File Contents	File Provided By
SHADR/ GTsss_nnnnvv_SHA.TAB, .LBL	SHADR data files and associated PDS labels	Gravity/RS Team
SHBDR/ GTsss_nnnnvv_SHB.DAT, .LBL	SHBDR data files and associated PDS labels	Gravity/RS Team
RSDMAP/ GTsss_ffff_nnnn_cccc.IMG , .LBL	RSDMAP data files and associated PDS labels	Gravity/RS Team

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	Geosciences Node
INDEX.TAB	A table listing all data products on this volume	Gravity/RS Team

INDEX.LBL A PDS detached label that describes INDEX.TAB Gravity/RS Team

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	Geosciences Node
AVSIS.HTM, .PDF, .LBL	Archive Volume SIS (this document) as PDF and HTML, with detached PDS label	Geosciences Node
SHADR.TXT	Data Product SIS describing gravity field model coefficients (Applicable Document 3)	Gravity/RS Team
SHBDR.TXT	Data Product SIS describing gravity field model error covariance matrices (Applicable Document 4)	Gravity/RS Team
RSDMAP.TXT	Data Product SIS describing areoid and gravity anomaly maps (Applicable Document 5)	Gravity/RS 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	Geosciences Node
DATASET.CAT	Data set information for the PDS catalog	Gravity/RS Team
DSMAP.CAT	Map projection information	Gravity/RS Team
INSTHOST.CAT	MRO spacecraft information for the PDS catalog	MRO Project
RSSINST.CAT	Radio Science instrument information for the PDS catalog	Gravity/RS Team
MISSION.CAT	MRO mission information for the PDS catalog	MRO Project
PERSON.CAT	Personnel information for the PDS catalog (Team and PDS personnel responsible for generating the archive)	Gravity/RS Team
REF.CAT	References mentioned in other *.CAT files	Gravity/RS Team

3. Archive Volume Format

This section describes the format of Gravity / RS RDR Archive Volumes. Data that comprise the Archive will be formatted in accordance with Planetary Data System specifications (Applicable Documents 6 and 7).

3.1. File Formats

This section describes file formats for the kinds of files contained on Gravity / RS RDR archive volumes.

3.1.1. Document File Format

Document files with the .TXT suffix are ASCII files which may have embedded PDS labels. Each line in a .TXT file ends 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.

3.1.2. Tabular File Format

Tabular files (.TAB suffix) are ASCII files formatted for direct reading into many database management systems or spreadsheet programs 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.

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.

3.1.3. PDS Label Format

All data files in the archive have detached PDS labels. PDS labels are ASCII text files intended to be read by humans and by software. A PDS label consists of a series of statements in the form "keyword = value", where keywords are defined in either the main PDS Data Dictionary or the MRO Local Data Dictionary. For examples of PDS labels for Gravity / RS RDR products, see the Data Product SIS Documents (Applicable Documents 3, 4, and 5).

Each line of text in a detached label ends 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.

3.1.4. 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.

3.1.5. Science Data File Formats

The science data files in this archive are stored as ASCII, binary, and image data. For more information about the format and content of the data products, see the Data Product SIS (Applicable Documents 3, 4, and 5).

4. Archive Volume Generation

4.1. Data Transfer and Validation Methods

The Gravity/RS Team will deliver fully assembled archive volumes to the Geosciences Node according to the schedule in the Mars Reconnaissance Orbiter Archive Plan. Data will be transferred via the Internet provided by the Gravity/RS Team. The Gravity/RS Team is responsible for validating the data for science content and for compliance with this Archive Volume SIS and Data Product SIS documents [Applicable Documents 3, 4, and 5]. The PDS Geosciences Node is responsible for validating the data for compliance with PDS standards, and will also check that the data is compliant with the relevant SIS documents.

4.2. Data Product Sizes and Delivery Rates

Table 1 summarizes expected sizes and production rates for the Gravity / RS RDR Standard Products.

Table 1 – Standard Product Sizes and Delivery Rates

Product	Product Size	Production Rate (e.g., number of products per day or per delivery)	Expected Number of Products for Primary Mission (730 days)	Expected Total Data Volume for Primary Mission
SHADR	556 KB	1	2	1 MB
SHBDR	320 MB	1	2	700 MB
RSDMAP	507 KB	4	1	2 MB

4.3. Backup and Duplicates

The Gravity/RS Team will retain a backup copy of all data delivered to PDS at least until the data have been released by PDS to the public. The PDS will retain backup copies of the data according to PDS policy, including on-site and off-site backups and long-term storage of data at the National Space Science Data Center (NSSDC).

4.4. Labeling and Identification

There will be a single online volume of Gravity/RS reduced data, to which new and revised files are added during the course of the mission. The PDS Volume ID for this volume is USA_NASA_PDS_MRORS_1XXX. The PDS Data Set ID for the Gravity/RS reduced data is MRO-M-RSS-5-SDP-V1.0.

5. Support Staff and Cognizant Persons

Maria Zuber, MRO Radio Science / Gravity Principal Investigator, Massachusetts Institute of Technology, Zuber@tharsis.gsfc.nasa.gov.

Frank Lemoine, MRO Radio Science / Gravity Archive Representative, NASA/Goddard Space Flight Center, Frank.G.Lemoine@nasa.gov.

Susan Slavney, PDS Geosciences Node, Washington University in St. Louis, Susan.Slavney@wustl.edu.