Revision B

Project Magellan
Software Interface Specification

# Mosaicked Image Data Record Compact Disc-Read Only Memory (MIDR CD-ROM )

IDPS–145

Prepared by: Sarah McMullen

April 24, 1992

National Aeronautics and Space Administration

JPL

**Jet Propulsion Laboratory**
California Institute of Technology
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PROJECT MAGELLAN

# SOFTWARE INTERFACE SPECIFICATION

COVER SHEET

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NUMBER: IDPS-145

REVISION B

DATE: 24 April 1992

## SIS NAME:

Mosaicked Image Data Record Compact Disc - Read Only Memory (MIDR CD-ROM)

## DOMAIN:

| System | Subsystem | Program | Make/Use |
|---|---|---|---|
| GDS | IDPS | Various | Make |
| GDS | Science | Various | Use |

## PURPOSE OF INTERFACE (SUMMARY):

This interface describes the content and format of the MIDR CD-ROM

## INTERFACE MEDIUM:

Compact Disc

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## DISTRIBUTION LIST

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## Document Change Log

| Change Order | Date | Affected Portions |
|---|---|---|
| Original | July 3, 1991 | All |
| Revision A | December 2, 1991 | Paragraphs 3.2.2.1 and 3.2.2.3, per MCR # 1289 |
| Revision B | April 24, 1992 | Paragraph 3.2.2.7 GEOM..TAB Label, per MCR # 1364 |

## TBD Items

| Page | Closure Date | Item Description |
|---|---|---|
| 3-25 | October 1, 1991 | P-MIDR Label |

# ACRONYMS & ABBREVIATIONS

**ASCII**.............. American Standard Code for Information Interchange
**CCT**................ Computer Compatible Tape
**CD**.................. Compact Disc
**Cx-MIDR**.......... Compressed Resolution (x=1, 2, or 3) Mosaicked Image Data Record
**DMAT**.............. Data Management and Archive Team
**EDR**................ Experiment Data Record
**EOF**................ End of File
**F-MIDR**............ Full Resolution Mosaicked Image Data Record
**IDPS**............... Image Data Processing Subsystem
**ISO**................. International Standards Organization
**JPL**................ Jet Propulsion Laboratory
**Mbytes**............ Megabytes
**MIDR**............... Mosaicked Image Data Record
**MIPL**............... Multi-Image Processing Laboratory
**MIPS**............... Mulimission Image Processing Subsystem
**MOS**............... Mission Operations System
**MOSST**........... MOS Science Team
**PDS**................ Planetary Data System
**ROM**............... Read Only Memory
**SAR**................ Synthetic Aperture Radar
**SIS**................. Software Interface Specification
**SPIDS**............. Standards for Preparation and Interchange of Data Sets
**TBD**................ To Be Determined
**VICAR**............. MIPS Image Processing Software System
**WORM**............. Write-Once Read-Many optical disk(s)
**XAR**................ Extended Attribute Record

# IDPS–145
# Mosaicked Image Data Record
# Compact Disc - Read Only Memory
# (MIDR CD-ROM)
# Software Interface Specification

# 1. INTRODUCTION

## 1.1 Content Overview

This Software Interface Specification (SIS) describes the form and content of the Mosaicked Image Data Record Compact Disc - Read Only Memory (MIDR CD-ROM).

All approved Magellan MIDR data, consisting of F-MIDRs, C1-MIDRs, C2-MIDRs, C3-MIDRs, and P-MIDRs, shall be contained in the complete set of MIDR CD-ROMs. Each CD-ROM shall contain 10 MIDR products and associated documentation. MIDRs generated by the Image Data Processing Subsystem (IDPS) shall be recorded on CD-ROMs in the order they are requested. F-MIDRs and C1-MIDRS, depending on the approved copies, may have had cross track smoothing or seam removal procedures applied to them.

All data formats are based on the Planetary Data System document SPIDS and DPW [see reference 1 and 4] and are similar to the formats used in generating the Voyager CD-ROM set [see reference 2].

Section 1 of this document contains general information. Section 2 describes characteristics of the physical media (CD) used in transmitting MIDRs, and Section 3 specifies their logical (media-independent) contents.

## 1.2 Scope

The specifications in this document apply to all MIDR CD-ROMs that are produced during the Magellan mission.

## 1.3 Applicable Documents

The italicized trailers to each document citation (following the dash) indicate the applicability of the document to this product and/or SIS.

[1] Standards for the Preparation and Interchange of Data Sets (SPIDS 1.1). ***D-4683*** . June 1989.---*PDS label and table formats.*

[2] Voyagers to the Outer Planets, volumes 1-8 (on CD-ROMs), Planetary Data System, 1989.---*Data Format*

[3] ISO 9660-1988. April 1988---*CD-ROM format.*

[4] PDS Data Preparation Workbook (DPW). ***D-7669***. May 1991.---*PDS label and table formats.*

[5] Production and Distribution Plan. ---*Production of CD-ROMs from WORM disks.*

[6] Full-resolution Basic Image Data Record Software Interface Specification (F-BIDR SIS). Revision B ***SDPS-101***. Feb. 14, 1991.---*Structure and content of F-BIDRs.*

[7] Mosaicked Image Data Record Software Interface Specification (MIDR SIS). Revision B ***IDPS-109***. Jan. 16, 1991.---*Structure and content of MIDRs.*

[8] Polar Mosaicked Image Data Record Software Interface Specification (P-MIDR SIS). To be written.---*Structure and content of P-MIDRs.*

[9] IDPS Directory File Software Interface Specification Revision C ***IDPS-130*** Feb. 28, 1991---*Structure and content of directory files.*

# 2 INTERFACE CHARACTERISTICS

## 2.1 Data Source, Destinations, and Transfer Method

MIDR CD-ROMs shall be produced by IDPS for the distribution of standard products to the Magellan Science community. IDPS shall use commercially available CD-ROM publishing software, which shall reside at MIPL, to produce premastered tapes for delivery to DMAT. DMAT will release these tapes to the mastering vendor for production of CD-ROMs. The mastering vendor will ship some replicated discs to authorized science investigators, and the remainder to DMAT for archiving and distribution.

## 2.2 Generation Method and Frequency

CD-ROMs shall be produced from MOSST-approved WORM disks as specified in the Production and Distribution Plan [see reference 5].

CD-ROMs shall be produced at the rate of two per week.

## 2.3 Volume and Size

Each CD-ROM shall contain ten MIDRs.

Each CD-ROM shall contain at most 650 Mbytes of data.

## 2.4 Interface Medium Characteristics

MIDR CD-ROM physical characteristics shall conform to industry standards [see reference 3].

## 2.5 Backup and Duplicate Copies

The entire contents of each CD-ROM shall be backed up onto WORM disks which shall be maintained by IDPS.

## 2.5 DMAT Label ID

Each MIDRCD tape or CD-ROM to be sent to an institution for evaluation or to be sent to the vendor will bear a label id using the following format:

ACRONYM.SEQUENCE;VERSION

ACRONYM = MIDRCD

SEQUENCE = A number three digits in length and determined by the DMAT processing request. Zero fill is required where the number is less than three digits.

VERSION = A single digit determining version number of the CD-ROM.

EXAMPLE = MIDRCD.003;1

A directory file containing catalog information about this tape will be sent to DMAT at the time the tape for the vendor is sent to DMAT. The contents of this directory file is described in reference [9].

# 3 CD-ROM CONTENT AND FORMAT

This section describes in detail the format and content of the MIDR CD-ROM.

## 3.1 Format

MIDR CD-ROM data shall be formatted in accordance with Planetary Data System specifications [see references 1, 4]. The format shall be similar to that of the Voyager CD-ROMs.

### 3.1.1 Disc Format

The MIDR-CD ROM format shall be compatible with various computer systems including IBM PC, Macintosh, Sun, VAX. The MIDR CD-ROM format shall be in accordance with ISO 9660 level 1 Interchange Standard [see reference 3], with file attributes specified by Extended Attribute Records (XARs) (logical blocks of 512 bytes), to provide a file system of directories, sub-directories, and data files. Computer systems that do not support XARs will either ignore them or append them to the beginning of the file. In the latter case, the user must ignore the first 512 bytes of each file.

### 3.1.2 File Formats

The following paragraphs describe file formats for the various kinds of files contained on CD-ROMs.

#### 3.1.2.1 Document Files

Document files (.TXT suffix) only exist in the root directory. They are ASCII files with embedded PDS labels. All document files contain 80-byte fixed-length records, with a carriage return character (ASCII 13) in the 79th byte and a line feed character (ASCII 10) in the 80th byte. This allows the files to be read by the HFS, DOS, Unix, and VMS operating systems.

#### 3.1.2.2 Tabular Files

Tabular files (.TAB suffix) exist in the root directory, in the index directory, and in the MIDR subdirectories. Tabular files (except HIST.TAB) 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.) 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 normal text file on other computers.

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 CONTENTS.TAB is accompanied by the detached label file CONTENTS.LBL in the same directory.

### 3.1.2.3 PDS Label Files

PDS label files (.LBL suffix) are located in all directories. They are descriptive labels [see reference 4 and paragraph 3.2.2] and may be embedded or detached from their associated file. The PDS label file is an object-oriented file; 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 that the object starts at the given location. 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. For example:

```
^IMAGE_HEADER = ("C1F02.IMG",1)
^IMAGE = ("C1F02.IMG",3)
```

indicates that the IMAGE object begins at record 3 of the file C1F02.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 upper-case file name, |
| ext | is the 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 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.

The detached labels for MIDRs also contain PDS-defined map projection keywords that provide information needed to extract latitude and longitude values from given line and sample locations.

All detached labels contain 80-byte fixed-length records, with a carriage return character (ASCII 13) in the 79th byte and a line feed character (ASCII 10) in the 80th byte. This allows the files to be read by the HFS, DOS, Unix, and VMS operating systems.

### 3.1.2.4 Browse Image Files

Browse image files (BROWSE.IMG) exist in the MIDR subdirectories. Each of the MIDR subdirectories contains a browse image file, which provides a quick-look version of that MIDR. The file is 896 lines by 1024 samples, created by averaging groups of 8x8 pixels in the original 7168x8192 MIDR. Browse image files contain embedded VICAR2 labels and have detached PDS labels. The VICAR2 label is from the original 7168x8192 MIDR; therefore, corner point, map projection, and pixel size label items may be inappropriate for the BROWSE.IMG.

### 3.1.2.5 Framelet Files

Framelet files (.IMG suffix) are found in the MIDR sudirectories. Each file is a fraction of the data from the actual MIDR [see reference 8]. To produce these files, the MIDR is divided into an array of 56 framelets, arranged in seven rows and eight columns. The framelets are numbered in increasing order from left to right, top to bottom, and each framelet is stored in a separate file. A framelet is 1024 lines by 1024 samples, with one byte per sample. The framelet files contain embedded VICAR2 labels and have detached PDS labels. The MIDRs are all in the sinusoidal equal area map projection, except P-MIDRs which are in the polar stereographic map projection.

## 3.2 Content

The set of MIDR CD-ROMs contains all MIDRs, including P-MIDR segments as they are requested (P-MIDR segments will be one-sixteenth of the complete P-MIDR as delivered on CCT). Ten MIDRs are contained on each CD-ROM. The following paragraphs describe the content of the CD-ROMs.

### 3.2.1 Directories

The MIDR CD-ROM directory structure consists of one root directory, a label subdirectory, an index subdirectory, and ten MIDR subdirectories. Files in the root directory provide tables and text describing the MIDR CD-ROMs, MIDR products, and geologic features of Venus. Files in the index directory describe the contents of the MIDR frames on that CD and all previously produced CDs. Files in the label subdirectory are the same on all CD-ROMs and contain Magellan data product information (see Appendix C). Files in each of the MIDR subdirectories consist of a browse image file, three table files (frame, geometry, and histogram), 56 framelet image files, and associated label files. The following tables describe the content and source of files in the MIDR CD-ROM directories. (Source indicates group providing current version of file.)

#### 3.2.1.1 Root Directory

The following table lists the files in the root directory.

| File | Contents | Source |
|---|---|---|
| AAREADME.TXT | CD-ROM content and format information | IDPS |
| MCUMCOMM.TXT | A cumulative listing of comments concerning all MIDR CD-ROMs published so far | Wash. U |
| GEO.TAB | A table of IAU-approved Venus geologic features | MOSST |
| GEO.LBL | A PDS detached label that describes GEO.TAB | MOSST |
| VOLDESC.SFD | A description of the contents of this CD-ROM volume in a format readable by both humans and computers | PDS |

### 3.2.1.2 Index Directory

The following table lists the files in the index subdirectory.

| File | Contents | Source |
|---|---|---|
| MCUMDIR.TAB | A table listing all MIDR products published so far, including the MIDRs on this CD-ROM | IDPS |
| MCUMDIR.LBL | A PDS detached label that describes MCUMDIR.TAB | IDPS |
| CONTENTS.TAB | A tabular listing of each MIDR frame on this disc, the directory in which it is located, and its extent in latitude and longitude. Also includes whether MIDR has had seam removal procedures applied | IDPS |
| CONTENTS.LBL | A PDS detached label that describes CONTENTS.TAB | IDPS |

### 3.2.1.3 Label Directory

The label directory contains catalog information describing the major Magellan data products submitted to PDS. The contents of this directory provides a top-level understanding of the Magellan Mission, radar experiment, processing, and data products. Further information on MIDR products can also be obtained from the Magellan Software Interface Specification (SIS) documents [see references 6, 7, and 8]. The following table lists the files in the label directory.

| File | Contents | Source |
|---|---|---|
| CATALOG.LBL | PDS high-level experiment-description catalog information | PDS |
| C1MIDRDS.LBL | PDS high-level data set catalog information for C1-MIDR | PDS |
| C2MIDRDS.LBL | PDS high-level data set catalog information for C2-MIDR | PDS |
| C3MIDRDS.LBL | PDS high-level data set catalog information for C3-MIDR | PDS |
| FBIDRDS.LBL | PDS high-level data set catalog information for F-BIDR. This file provides the information on how to extract radar backscatter cross section from MIDRs, given the incidence angle information from GEOM.TAB and the image data | PDS |
| FMIDRDS.LBL | PDS high-level data set catalog information for F-MIDR | PDS |
| NPMIDRDS.LBL | PDS high-level data set catalog information for North P-MIDR | PDS |
| SPMIDRDS.LBL | PDS high-level data set catalog information for South P-MIDR | PDS |
| DSMAPC1.LBL | PDS high-level data set catalog information describing C1-MIDR cartographic projections and references. This and following map projection files allow computation of latitude and longitude from image line and sample, using either VICAR2 or PDS label data | PDS |
| DSMAPC2.LBL | PDS high-level data set catalog information describing C2-MIDR cartographic projections and references | PDS |
| DSMAPC3.LBL | PDS high-level data set catalog information describing C3-MIDR cartographic projections and references | PDS |
| DSMAPF.LBL | PDS high-level data set catalog information describing F-MIDR cartographic projections and references | PDS |
| DSMAPP.LBL | PDS high-level data set catalog information describing P-MIDR cartographic projections and references | PDS |

### 3.2.1.4 MIDR Directories

The ten MIDR directories contain the actual MIDR data in framelet files that make up a single 7168 line by 8192 sample mosaic. MIDR directories are named:

`x(y)nnzmmm,`

where

| | |
|---|---|
| x | is either C (compressed mosaic) or F (full mosaic), |
| y | is either 1, 2 or 3, (C1-MIDR, C2-MIDR, or C3-MIDR, i.e. once, twice, or thrice compressed using 3x3 moving averaging) or not present for full mosaic |
| nn | is the center latitude of the mosaic, (integer, zero-padded to two digits) |
| z | is N or S (north or south latitude), (the equator is treated as north) |
| mmm | is the center longitude of the mosaic. Both center latitude and longitude have been rounded off to the nearest integer number (integer, zero-padded to three digits) |

The following table lists the files in the MIDR directories.

| File | Contents | Source |
|---|---|---|
| BROWSE.IMG | The browse version of the MIDR, 896 lines by 1024 samples, created by averaging groups of 8x8 pixels in the original MIDR | IDPS |
| BROWSE.LBL | A PDS detached label that describes BROWSE.IMG | IDPS |
| FRAME.TAB | A table describing the range of latitude and longitude within each image framelet | IDPS |
| FRAME.LBL | A PDS detached label that describes FRAME.TAB | IDPS |
| GEOM.TAB | Selected entries from the Magellan Experimenter's Notebook. The Notebook is generated from the Magellan Radar Mapping Sequencing Software and is based on predicted information. GEOM.TAB provides the orbit numbers of the MIDR, and also provides radar viewing geometry and image quality information. | IDPS |
| GEOM.LBL | A PDS detached label that describes GEOM.TAB | IDPS |
| HIST.TAB | A binary histogram of pixel values in each 8192x7168 MIDR | IDPS |

| | | |
|---|---|---|
| HIST.LBL | A PDS detached label that describes HIST.TAB | IDPS |
| x[y]Fnn.IMG | A 1024x1024 image framelet, where x is C (compressed mosaic) or F (full mosaic), y is 1, 2, 3 or not present (C1-MIDR, C2-MIDR, C3-MIDR, or F-MIDR), and nn is the framelet number (01 through 56) | IDPS |
| x[y]Fnn.LBL | PDS detached labels describing the framelet files, where x, y, and nn are the same as given above | IDPS |
| PMIDR | Data and ancillary files pending PMIDR SIS publication | IDPS |

### 3.2.2 Files

The contents of the MIDR CD-ROM files are described in the following paragraphs. Each paragraph lists one detached PDS label which describes its corresponding file (image or tabular). Paragraphs 3.2.2.5 through 3.2.2.8 list labels found within each MIDR subdirectory (DSMAPF.LBL is located in the label subdirectory, but is pointed to by the framelet labels). The keywords on the left are static; the values on the right are not.

NOTE

The labels listed below are not literally reproduced. For the exact structure of PDS labels refer to SPIDS 1.1 [see reference 1 and 4].

#### 3.2.2.1 MCUMDIR.TAB Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001   = SFDU_LABEL
RECORD_TYPE                                = FIXED_LENGTH
RECORD_BYTES                               = 80
FILE_RECORDS                               = 20
^TABLE                                     = "MCUMDIR.TAB"

SPACECRAFT_NAME                            = MAGELLAN
MISSION_PHASE_NAME                         = PRIMARY_MISSION
TARGET_NAME                                = VENUS
INSTRUMENT_NAME                            = 'RADAR SYSTEM'
NOTE                                       = "This table lists all MIDR products
                                              published on CD-ROM so far, including
                                              the products on this CD-ROM."
```

```
OBJECT                          = TABLE
 INTERCHANGE_FORMAT             = ASCII
 ROWS                           = 20
 COLUMNS                        = 5

 OBJECT                         = COLUMN
  NAME                          = VOLUME_ID
  DESCRIPTION                   = "Volume ID of the CD-ROM in which
                                the product is located."
  DATA_TYPE                     = CHARACTER
  START_BYTE                    = 2
  BYTES                         = 7
 END_OBJECT                     = COLUMN

 OBJECT                         = COLUMN
  NAME                          = DIRECTORY_NAME
  DESCRIPTION                   = "Directory name on the volume in
                                which the product is located."
  DATA_TYPE                     = CHARACTER
  START_BYTE                    = 12
  BYTES                         = 8
 END_OBJECT                     = COLUMN

 OBJECT                         = COLUMN
  NAME                          = PRODUCT_ID
  DESCRIPTION                   = "Magellan DMAT identification of
                                product. Example: F-MIDR.20N334;1".
  DATA_TYPE                     = CHARACTER
  START_BYTE                    = 23
  BYTES                         = 18
 END_OBJECT                     = COLUMN

 OBJECT                         = COLUMN
  NAME                          = PUBLICATION_DATE
  DESCRIPTION                   = "CD-ROM publication date."
  DATA_TYPE                     = CHARACTER
  START_BYTE                    = 44
  BYTES                         = 10
 END_OBJECT                     = COLUMN

 OBJECT                         = COLUMN
  NAME                          = LOOK_DIRECTION
  DESCRIPTION                   = "Radar look direction. Examples are:
                                LEFT, RIGHT, STEREO, MAXWELL,
                                MIXED"
  DATA_TYPE                     = CHARACTER
  START_BYTE                    = 57
  BYTES                         = 15
 END_OBJECT                     = COLUMN

 END_OBJECT                     = TABLE
END
```

### 3.2.2.2 GEO.TAB Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001  = SFDU_LABEL
RECORD_TYPE                               = FIXED_LENGTH
RECORD_BYTES                              = 284
FILE_RECORDS                              = 529
^TABLE                                    = "GEO.TAB"
TARGET_NAME                               = VENUS
MISSION_NAME                              = MAGELLAN
DESCRIPTION                               = "This table contains the location and
                                          geological type of all Venus features
                                          defined by the International
                                          Astronomical Union (IAU) prior to
                                          January 1, 1990."
OBJECT                                    = TABLE
 INTERCHANGE_FORMAT                       = ASCII
 ROWS                                     = 529
 COLUMNS                                  = 8

 OBJECT                                   = COLUMN
  NAME                                    = MINIMUM_LATITUDE
  DATA_TYPE                               = REAL
  UNIT                                    = DEGREE
  START_BYTE                              = 1
  BYTES                                   = 8
  DESCRIPTION                             = "The minimum_latitude element
                                          specifies the southernmost latitude of the
                                          feature."
 END_OBJECT                               = COLUMN

 OBJECT                                   = COLUMN
  NAME                                    = MAXIMUM_LATITUDE
  DATA_TYPE                               = REAL
  UNIT                                    = DEGREE
  START_BYTE                              = 10
  BYTES                                   = 8
  DESCRIPTION                             = "The maximum_latitude element
                                          specifies the northernmost latitude of the
                                          feature."
 END_OBJECT                               = COLUMN

 OBJECT                                   = COLUMN
  NAME                                    = MINIMUM_LONGITUDE
  DATA_TYPE                               = REAL
  UNIT                                    = DEGREE
  START_BYTE                              = 19
  BYTES                                   = 8
  DESCRIPTION                             = "The minimum_longitude element
                                          specifies the westernmost (left_most)
                                          longitude of the feature."
 END_OBJECT                               = COLUMN

 OBJECT                                   = COLUMN
```

```
  NAME               = MAXIMUM_LONGITUDE
  DATA_TYPE          = REAL
  UNIT               = DEGREE
  START_BYTE         = 28
  BYTES              = 8
  DESCRIPTION        = "The maximum_longitude element
                       specifies the easternmost (right_most)
                       longitude of the feature."
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  NAME               = FEATURE_TYPE
  DATA_TYPE          = CHARACTER
  UNIT               = 'N/A'
  START_BYTE         = 38
  BYTES              = 55
  DESCRIPTION        = "Official IAU designation for type of
                       feature.  Examples are:  ARACHNOID
                       FLOW   PLANUM (PLANA)  CALDERA
                       FOSSA (FOSSAE)    REGIO (REGIONES)
                       CHASMA (CHASMATA)    LINEARUPES
                       COLLIS (COLLES)      LINEAMENT
                       TERRA (TERRAE)    CORONA (CORONAE)
                       MONS (MONTES)    TESSERA (TESSERAE)
                       CRATER    OVOID    THOLUS (THOLI)
                       DOME    PATERA (PATERAE)
                       DORSUM (DORSA)
                       PLANITIA (PLANITIAE) "
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  NAME               = SEARCH_FEATURE_NAME
  DATA_TYPE          = CHARACTER
  UNIT               = 'N/A'
  START_BYTE         = 96
  BYTES              = 80
  DESCRIPTION        = "The geographical feature name with
                       all diacritical marks and punctuation
                       stripped off.  This name uses only
                       uppercase ASCII alphabetic characters
                       and can be used for sorting and searching
                       since it is unique within this table.  When
                       printing the name, the diacritic_feature_
                       name should be used instead."
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  NAME               = DIACRITIC_FEATURE_NAME
  DATA_TYPE          = CHARACTER
  UNIT               = 'N/A'
  START_BYTE         = 179
  BYTES              = 80
```

DESCRIPTION = "The geographical feature name containing standard diacritical information. Contains upper and lower case letters. The name with the diacritical marks should be used when printing the feature name.

DIACRITICALS USED IN THE TABLE

The word diacritic comes from a Greek word meaning to separate. It refers to the accent marks employed to separate, or distinguish, one form of pronunciation of a vowel or consonant from another.

This note is included to familiarize the user with the codes used to represent diacriticals found in the table, and the values usually associated with them. In the table, the code for a diacritical is preceded by a backslash and is followed, without a space, by the letter it is modifying.

This note is organized as follows: the code is listed first, followed by the name of the accent mark, if applicable, a brief description of the appearance of the diacritical and a short narrative on its usage.

\% acute accent; a straight diagonal line extending from upper right to lower left. The acute accent is used in most languages to lengthen a vowel; in some, such as Oscan, to denote an open vowel. The acute is also often used to indicate the stressed syllable; in some transcriptions it indicates a palatalized consonant.

\: diaeresis or umlaut; two dots surmounting the letter. In Romance languages and English, the diaeresis is used to indicate that consecutive vowels do not form a dipthong (see below); in modern German and Scandinavian languages, it denotes palatalization of vowels.

\^ circumflex; a chevron or inverted 'v' shape, with the apex at the top. Used most often in modern languages to indicate lengthening of a vowel.

\~ tilde; a curving or waving line above the letter. The tilde is a form of circumflex. The tilde is used most often in Spanish to form a palatalized n as in the word 'ano', pronounced 'anyo'. It is also used occasionally to indicate nasalized vowels.

\- macron; a straight line above the letter. The macron is used almost universally to lengthen a vowel.

\u breve; a concave semicircle or 'u' shape surmounting the letter. Originally used in Greek, the breve indicates a short vowel.

\o a small circle or 'o' above the letter. Frequently used in Scandinavian languages to indicate a broad 'o'.

\ae dipthong or ligature; transcribed as two letters in contact with each other. The dipthong is a combination of vowels that are pronounced together.

\, cedilla; a curved line surmounted by a vertical line, placed at the bottom of the letter. The cedilla is used in Spanish and French to denote a dental, or soft, 'c'. In the new Turkish transcription, 'c' cedilla has the value of English 'ch'. In Semitic languages, the cedilla under a consonant indicates that it is emphatic.

\v check or inverted circumflex; a 'v' shape above the letter. This accent is used widely in Slavic languages to indicate a palatal articulation, like the consonant sounds in the English words chapter and shoe and the 'zh' sound in pleasure.

\. a single dot above the letter. This diacritical denotes various things; in Lithuanian, it indicates a close long vowel. In Sanskrit, when used with 'n', it is a velar sound, as in the English 'sink'; in Irish orthography, it indicates a fricative consonant (see below).

\' accent grave; a diagonal line (above the letter) extending from upper left to lower right. The grave accent is used in French, Spanish and Italian to denote open vowels.

_ fricative; a horizontal line through a consonant. A fricative consonant is characterized by a frictional rustling of the breath as it is emitted.

Sources: Webster's New Collegiate Dictionary, G.& C. Merriam Co. Springfield, Mass., and Collier's Encyclopedia, P.F. Collier, Inc., London and New York "

```
END_OBJECT          = COLUMN

OBJECT              = COLUMN
 NAME               = FEATURE_STATUS_TYPE
 DATA_TYPE          = CHARACTER
 UNIT               = 'N/A'
 START_BYTE         = 262
 BYTES              = 20
 DESCRIPTION        = "The IAU approval status of the named
                      feature. Permitted values are
                      'PROPOSED', 'PROVISIONAL', 'IAU-
                      APPROVED', and 'DROPPED'.
                      DROPPED names have been disallowed
                      by the IAU, but are included in this table
```

```
                                          since they may still be found on some
                                          maps. PROPOSED names have not yet
                                          been approved by the IAU, and they may
                                          subsequently be dropped, so they should
                                          not be used on maps until they become
                                          PROVISIONAL or IAU-APPROVED."
 END_OBJECT                               = COLUMN
 END_OBJECT                               = TABLE
END
```

### 3.2.2.3 CONTENTS.TAB Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001  = SFDU_LABEL
RECORD_TYPE                               = FIXED_LENGTH
RECORD_BYTES                              = 80
FILE_RECORDS                              = 10
^TABLE                                    = "CONTENTS.TAB"

SPACECRAFT_NAME                           = MAGELLAN
MISSION_PHASE_NAME                        = PRIMARY_MISSION
TARGET_NAME                               = VENUS
INSTRUMENT_NAME                           = 'RADAR SYSTEM'
NOTE                                      = "This table lists all MIDRs on this
                                          volume. It also includes the latitude and
                                          longitude range for each MIDR and the
                                          directory in which it is found."

OBJECT                                    = TABLE
 INTERCHANGE_FORMAT                       = ASCII
 ROWS                                     = 10
 COLUMNS                                  = 9

 OBJECT                                   = COLUMN
  NAME                                    = PRODUCT_TYPE
  DESCRIPTION                             = "Magellan DMAT type code. Possible
                                          values are F-MIDR, C1-MIDR, C2-MIDR,
                                          C3-MIDR, and P-MIDR."
  DATA_TYPE                               = CHARACTER
  START_BYTE                              = 2
  BYTES                                   = 7
 END_OBJECT                               = COLUMN

 OBJECT                                   = COLUMN
  NAME                                    = PRODUCT_ID
  DESCRIPTION                             = "Magellan DMAT name of product.
                                          Example: F-MIDR.20N334;1."
  DATA_TYPE                               = CHARACTER
  START_BYTE                              = 12
  BYTES                                   = 18
 END_OBJECT                               = COLUMN

OBJECT                                    = COLUMN
```

```
NAME                = SEAM_CORRECTION_TYPE
 DESCRIPTION        = "A value of C indicates that cross- track
                      seam correction has been applied.  A
                      value of R indicates that  the correction
                      has not been applied."
 DATA_TYPE          = CHARACTER
 START_BYTE         = 33
 BYTES              = 1
END_OBJECT          = COLUMN

OBJECT              = COLUMN
 NAME               = MAXIMUM_LATITUDE
 DESCRIPTION        = "Northernmost frame latitude rounded
                      to the nearest degree."
 DATA_TYPE          = INTEGER
 UNIT               = DEGREE
 START_BYTE         = 36
 BYTES              = 3
END_OBJECT          = COLUMN

OBJECT              = COLUMN
 NAME               = MINIMUM_LATITUDE
 DESCRIPTION        = "Southernmost frame latitude rounded
                      to the nearest degree."
 DATA_TYPE          = INTEGER
 UNIT               = DEGREE
 START_BYTE         = 40
 BYTES              = 3
END_OBJECT          = COLUMN

OBJECT              = COLUMN
 NAME               = MAXIMUM_LONGITUDE
 DESCRIPTION        = "Easternmost frame longitude rounded
                      to the nearest degree."
 DATA_TYPE          = INTEGER
 UNIT               = DEGREE
 START_BYTE         = 44
 BYTES              = 3
END_OBJECT          = COLUMN

OBJECT              = COLUMN
 NAME               = MINIMUM_LONGITUDE
 DESCRIPTION        = "Westernmost frame longitude rounded
                      to the nearest degree."
 DATA_TYPE          = INTEGER
 UNIT               = DEGREE
 START_BYTE         = 48
 BYTES              = 3
END_OBJECT          = COLUMN

OBJECT              = COLUMN
NAME                = FRAME_FILE_NAME
```

```
   DESCRIPTION                 = "pathname of framelet label relative
                               to CD-ROM root directory."

   DATA_TYPE                   = CHARACTER
   START_BYTE                  = 53
   BYTES                       = 19
  END_OBJECT                   = COLUMN

 OBJECT                        = COLUMN
   NAME                        = LOOK_DIRECTION
   DESCRIPTION                 = "Radar look direction. Examples are:
                               L (EFT), R(IGHT), MI(X)ED, S(TEREO),
                               (M)AXWELL"
   DATA_TYPE                   = CHARACTER
   START_BYTE                  = 75
   BYTES                       = 1
  END_OBJECT                   = COLUMN

 END_OBJECT                    = TABLE

 END
```

### 3.2.2.4 VOLDESC.SFD Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001   = SFDU_LABEL
OBJECT                                     = VOLUME
 VOLUME_SET_NAME                           = "MISSION TO VENUS"
 VOLUME_SET_ID                             = 'USA_NASA_JPL_MG_0005'
 VOLUMES                                   = 'UNK'
 VOLUME_NAME                               = "Magellan : Mosaic Image Data"
 VOLUME_ID                                 = MG_0005
 VOLUME_VERSION_ID                         = 'VERSION 1'
 MEDIUM_TYPE                               = 'CD-ROM'
 PUBLICATION_DATE                          = 1991-06-30
 VOLUME_DESC                               = "This volume contains a collection of
                                           MIDR products. These data are mosaics
                                           of the surface of Venus generated from
                                           Magellan radar images. Typically, the
                                           collection will contain F-MIDR, C1-
                                           MIDR, C2-MIDR, C3-MIDR, or P-MIDR
                                           products. The volume also contains
                                           documentation and index files to support
                                           access and use of the mosaics."
 OBJECT                                    = DATA_PRODUCER
  PRODUCER_INSTITUTION_NAME                = 'JET PROPULSION LABORATORY'
  PRODUCER_FACILITY_NAME                   = 'MULTI-MISSION IMAGE
                                           PROCESSING SUBSYSTEM'

  PRODUCER_FULL_NAME                       = 'N/A'
  DISCIPLINE_NAME                          = 'GEOSCIENCES'
  ADDRESS_TEXT                             = "JET PROPULSION LABORATORY  \n
                                           IMAGE DATA PROCESSING TEAM  \n
                                           MAILSTOP 168-527  \n
                                           PASADENA, CA 91109  USA"
```

```
END_OBJECT                              = DATA_PRODUCER

OBJECT                                  = CATALOG
 ^CATALOG                               = "CATALOG.LBL"
 ^DATA_SET_CATALOG                      = {"FBIDRDS.LBL", "C1MIDRDS.LBL",
                                        "C2MIDRDS.LBL", "C3MIDRDS.LBL",
                                          "FMIDRDS.LBL", "NPMIDRDS.LBL",
                                        "SPMIDRDS.LBL"}
  ^DATA_SET_MAP_PROJECT_CATALOG         = {"DSMAPF.LBL", "DSMAPC1.LBL",
                                        "DSMAPC2.LBL", "DSMAPC3.LBL",
                                        "DSMAPP.LBL"}
END_OBJECT  = CATALOG

END_OBJECT  = VOLUME
END
```

### 3.2.2.5 BROWSE.IMG Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001     = SFDU_LABEL
/* Detached browse image format,size and location */
RECORD_TYPE                             = FIXED_LENGTH
RECORD_BYTES                            = 1024
FILE_RECORDS                            = 898
^IMAGE_HEADER                           = ("BROWSE.IMG",1)
^IMAGE                                  = ("BROWSE.IMG",3)
 /* Browse image description*/
SPACECRAFT_NAME                         = MAGELLAN
MISSION_PHASE_NAME                      = PRIMARY_MISSION
TARGET_NAME                             = VENUS
IMAGE_ID                                = 'F-MIDR.70N339;1'
DATA_SET_ID                             = 'MGN-V-RDRS-5-MIDR-FULL-RES-
V1.0'
INSTRUMENT_NAME                         = 'RADAR SYSTEM'
/* Description of the objects contained in browse image */
OBJECT                                  = IMAGE_HEADER
 TYPE                                   = VICAR2
 BYTES                                  = 1024
 RECORDS                                = 2
END_OBJECT
OBJECT                                  = IMAGE
 LINES                                  = 896
 LINE_SAMPLES                           = 1024
 SAMPLE_TYPE                            = UNSIGNED_INTEGER
 SAMPLE_BITS                            = 8
 DESCRIPTION                            = "This is a 1/8 scale browse version of
                                        the full mosaic frame made by averaging
                                        the pixel values."
END_OBJECT
END
```

### 3.2.2.6 FRAME.TAB Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001     = SFDU_LABEL
RECORD_TYPE                             = FIXED_LENGTH
```

```
RECORD_BYTES                  = 80
FILE_RECORDS                  = 56
^TABLE                        = "FRAME.TAB"

SPACECRAFT_NAME               = MAGELLAN
MISSION_PHASE_NAME            = PRIMARY_MISSION
TARGET_NAME                   = VENUS
IMAGE_ID                      = 'F-MIDR.70N339;1'
INSTRUMENT_NAME               = 'RADAR SYSTEM'
NOTE                          = "This table contains the latitude and
                              longitude limits of the framelets that
                              make up the mosaic identified by
                              IMAGE_ID."
OBJECT                        = TABLE
 INTERCHANGE_FORMAT           = ASCII
 ROWS                         = 56
 COLUMNS                      = 7

 OBJECT                       = COLUMN
  NAME                        = MAXIMUM_LATITUDE
  DESCRIPTION                 = "Northmost latitude of framelet."
  DATA_TYPE                   = REAL
  UNIT                        = DEGREE
  START_BYTE                  = 1
  BYTES                       = 8
 END_OBJECT                   = COLUMN

 OBJECT                       = COLUMN
  NAME                        = MINIMUM_LATITUDE
  DESCRIPTION                 = "Southmost latitude of framelet."
  DATA_TYPE                   = REAL
  UNIT                        = DEGREE
  START_BYTE                  = 10
  BYTES                       = 8
 END_OBJECT                   = COLUMN

 OBJECT                       = COLUMN
  NAME                        = MAXIMUM_LONGITUDE
  DESCRIPTION                 = "Eastmost longitude of framelet."
  DATA_TYPE                   = REAL
  UNIT                        = DEGREE
  START_BYTE                  = 19
  BYTES                       = 8
 END_OBJECT                   = COLUMN

 OBJECT                       = COLUMN
  NAME                        = MINIMUM_LONGITUDE
  DESCRIPTION                 = "Westmost longitude of framelet."
  DATA_TYPE                   = REAL
  UNIT                        = DEGREE
  START_BYTE                  = 28
```

```
  BYTES                                        = 8
 END_OBJECT                                    = COLUMN

 OBJECT                                        = COLUMN
  NAME                                         = VOLUME_ID
DESCRIPTION                                    = "Volume ID of the CD-ROM on which
                                               this product is located."
  DATA_TYPE                                    = CHARACTER
  START_BYTE                                   = 38
  BYTES                                        = 7
 END_OBJECT                                    = COLUMN

 OBJECT                                        = COLUMN
  NAME                                         = FRAMELET_FILE_NAME
  DESCRIPTION                                  = "Pathname of framelet label relative
                                               to root directory of CD-ROM."
  DATA_TYPE                                    = CHARACTER
  START_BYTE                                   = 48
  BYTES                                        = 24
 END_OBJECT                                    = COLUMN

 OBJECT                                        = COLUMN
  NAME                                         = FRAMELET_NUMBER
  DESCRIPTION                                  = "The framelet number. The mosaic is
                                               divided into 56 framelets, in an array of
                                               seven rows by eight columns. The
                                               framelets are numbered from left to right,
                                               top to bottom."
  DATA_TYPE                                    = INTEGER
  START_BYTE                                   = 74
  BYTES                                        = 2
 END_OBJECT                                    = COLUMN

END_OBJECT                                     = TABLE

END
```

### 3.2.2.7 GEOM.TAB Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001       = SFDU_LABEL
RECORD_TYPE                                    = FIXED_LENGTH
RECORD_BYTES                                   = 90
FILE_RECORDS                                   = 22
^TABLE                                         = "GEOM.TAB"

SPACECRAFT_NAME                                = MAGELLAN
MISSION_PHASE_NAME                             = PRIMARY_MISSION
TARGET_NAME                                    = VENUS
IMAGE_ID                                       = 'F-MIDR.70N339;1'
INSTRUMENT_NAME                                = 'RADAR SYSTEM'
NOTE                                           = "Geometry file for one MIDR. This file
                                               contains data in a table format for a set of
                                               line and sample pairs. The data are
```

```
                                  generated from the Magellan Radar
                                  Mapping Sequencing Software and are
                                  predictions. For an F-MIDR, the points
                                  are spaced every two degrees in latitude
                                  and longitude; for a Cx-MIDR, the points
                                  are spaced every four or five degrees.
                                  Some points may fall outside the MIDR."
OBJECT                            = TABLE
 INTERCHANGE_FORMAT               = ASCII
 ROWS                             = 22
 COLUMNS                          = 12

 OBJECT                           = COLUMN
  NAME                            = ORBIT_NUMBER
  DESCRIPTION                     = "Orbit number for F-BIDR or C-BIDR
                                  data used in the MIDR."
  DATA_TYPE                       = INTEGER
  UNIT                            = 'N/A'
  START_BYTE                      = 1
  BYTES                           = 4
 END_OBJECT                       = COLUMN

 OBJECT                           = COLUMN
  NAME                            = BORESIGHT_LATITUDE
  DESCRIPTION                     = "Latitude corresponding to antenna
                                  boresight intercept on surface."
  DATA_TYPE                       = REAL
  UNIT                            = DEGREE
  START_BYTE                      = 6
  BYTES                           = 8
 END_OBJECT                       = COLUMN

 OBJECT                           = COLUMN
  NAME                            = BORESIGHT_LONGITUDE
  DESCRIPTION                     = "Longitude corresponding to antenna
                                  boresight intercept on surface."
  DATA_TYPE                       = REAL
  UNIT                            = DEGREE
  START_BYTE                      = 15
  BYTES                           = 8
 END_OBJECT                       = COLUMN

 OBJECT                           = COLUMN
  NAME                            = SPACECRAFT_ALTITUDE
  DESCRIPTION                     = "Altitude of the spacecraft above the
                                  surface."
  DATA_TYPE                       = REAL
  UNIT                            = KILOMETER
  START_BYTE                      = 24
  BYTES                           = 8
 END_OBJECT                       = COLUMN

 OBJECT                           = COLUMN
```

```
 NAME           = GROUND_SWATH_WIDTH
 DESCRIPTION    = "Width of SAR swath on the ground."
 DATA_TYPE      = REAL
 UNIT           = KILOMETER
 START_BYTE     = 33
 BYTES          = 6
END_OBJECT      = COLUMN

OBJECT          = COLUMN
 NAME           = BORESIGHT_LOOK_ANGLE
 DESCRIPTION    = "Angle between antenna boresight and
                  nadir beneath spacecraft."
 DATA_TYPE      = REAL
 UNIT           = DEGREE
 START_BYTE     = 40
 BYTES          = 6
END_OBJECT      = COLUMN

OBJECT          = COLUMN
 NAME           = BORESIGHT_INCIDENCE_ANGLE
 DESCRIPTION    = "Angle between antenna boresight and
                  local surface normal."
 DATA_TYPE      = REAL
 UNIT           = DEGREE
 START_BYTE     = 47
 BYTES          = 6
END_OBJECT      = COLUMN

OBJECT          = COLUMN
 NAME           = RANGE_RESOLUTION
 DESCRIPTION    = "Radar resolution in range or cross track
                  direction."
 DATA_TYPE      = REAL
 UNIT           = METER
 START_BYTE     = 54
 BYTES          = 6
END_OBJECT      = COLUMN

OBJECT          = COLUMN
 NAME           = AZIMUTH_RESOLUTION
 DESCRIPTION    = "Radar resolution in azimuth or along
                  track direction."
 DATA_TYPE      = REAL
 UNIT           = METER
 START_BYTE     = 61
 BYTES          = 6
END_OBJECT      = COLUMN

OBJECT          = COLUMN
 NAME           = EFFECTIVE_LOOKS
 DESCRIPTION    = "Effective number of looks = (raw looks)
                  * (effective looks resolution/range
```

```
                                          resolution) * (effective looks
                                          resolution/azimuth resolution)."
    DATA_TYPE                             = REAL
    UNIT                                  = DIMENSIONLESS
    START_BYTE                            = 68
    BYTES                                 = 6
   END_OBJECT                             = COLUMN

   OBJECT                                 = COLUMN
    NAME                                  = PRED_SIGNAL_THERM_NOISE_
                                          RATIO
    DESCRIPTION                           = "Ratio of signal to thermal noise in the
                                          SAR data."
    DATA_TYPE                             = REAL
    UNIT                                  = DECIBEL
    START_BYTE                            = 75
    BYTES                                 = 6
   END_OBJECT                             = COLUMN

   OBJECT                                 = COLUMN
    NAME                                  = PREDICT_SIGNAL_AMBIGUITY_
                                          RATIO
    DESCRIPTION                           = "Ratio of signal due to scatter from
                                          surface elements within the scene to
                                          signal from surrounding areas."
    DATA_TYPE                             = REAL
    UNIT                                  = DECIBEL
    START_BYTE                            = 82
    BYTES                                 = 6
   END_OBJECT                             = COLUMN

  END_OBJECT                              = TABLE
  END
```

**3.2.2.8 HIST.TAB Label**

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001  = SFDU_LABEL
RECORD_TYPE                               = FIXED_LENGTH
RECORD_BYTES                              = 1024
FILE_RECORDS                              = 1
^IMAGE_HISTOGRAM                          = "HIST.TAB"
 /* Image histogram table*/
SPACECRAFT_NAME                           = MAGELLAN
MISSION_PHASE_NAME                        = PRIMARY_MISSION
TARGET_NAME                               = VENUS
IMAGE_ID                                  = 'F-MIDR.70N339;1'
INSTRUMENT_NAME                           = 'RADAR SYSTEM'
NOTE                                      = "Histogram of pixel values for entire
                                          MIDR."

 /* Description of the objects contained in file */
OBJECT                                    = IMAGE_HISTOGRAM
 ITEMS                                    = 256
 ITEM_BYTES                               = 4
```

```
 DATA_TYPE                                   = VAX_INTEGER
END_OBJECT                                   = IMAGE_HISTOGRAM
END
```

### 3.2.2.9 Framelets Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001     = SFDU_LABEL
/* Framelet file format, size and location*/
RECORD_TYPE                                  = FIXED_LENGTH
RECORD_BYTES                                 = 1024
FILE_RECORDS                                 = 1025
^IMAGE_HEADER                                = ("FF01.IMG",1)
^IMAGE                                       = ("FF01.IMG",2)
/* Framelet description */
DATA_SET_ID                                  = 'MGN-V-RDRS-5-MIDR-FULL-RES-
                                             V1.0'
SPACECRAFT_NAME                              = MAGELLAN
MISSION_PHASE_NAME                           = PRIMARY_MISSION
TARGET_NAME                                  = VENUS
IMAGE_ID                                     = 'F-MIDR.70N339;1'
INSTRUMENT_NAME                              = 'RADAR SYSTEM'
/* Description of objects contained in the framelet */
OBJECT                                       = IMAGE_HEADER
 TYPE                                        = VICAR2
 BYTES                                       = 1024
 RECORDS                                     = 1
END_OBJECT
OBJECT                                       = IMAGE
 LINES                                       = 1024
 LINE_SAMPLES                                = 1024
 SAMPLE_TYPE                                 = UNSIGNED_INTEGER
 SAMPLE_BITS                                 = 8
 NOTE                                        = "DN = INT({MIN[MAX(RV, -20), 30] +
                                             20})* 5) + 1
                                             where RV = radar cross section/area
                                             divided by the Muhleman Law and
                                             converted to decibels. Muhleman's Law
                                             multiplicative constant of 0.0118 was
                                             used. (Note: Intention was to use
                                             0.0188)."
END_OBJECT
OBJECT                                       = IMAGE_MAP_PROJECTION_
                                             CATALOG
 ^DATA_SET_MAP_PROJECT_CATALOG               = 'DSMAPF.LBL'
 DATA_SET_ID                                 = 'MGN-V-RDRS-5-MIDR-FULL-RES-
                                             V1.0'
 IMAGE_ID                                    = 'F-MIDR.70N339;1'
 MAP_PROJECTION_TYPE                         = SINUSOIDAL
 MAP_RESOLUTION                              = 1407.4 <PIXEL/DEG>
 MAP_SCALE                                   = 75 <M/PIXEL>
 MAXIMUM_LATITUDE                            = 72.5452
 MAXIMUM_LONGITUDE                           = 331.7914
 MINIMUM_LATITUDE                            = 71.8187
```

```
MINIMUM_LONGITUDE                        = 329.0879
X_AXIS_PROJECTION_OFFSET                 = 102153
Y_AXIS_PROJECTION_OFFSET                 = 4096
X_AXIS_FRAMELET_OFFSET                   = 1
Y_AXIS_FRAMELET_OFFSET                   = 1
A_AXIS_RADIUS                            = 6051.92 <KM>
B_AXIS_RADIUS                            = 6051.92 <KM>
C_AXIS_RADIUS                            = 6051.92 <KM>
FIRST_STANDARD_PARALLEL                  = 0.0000
SECOND_STANDARD_PARALLEL                 = 'N/A'
POSITIVE_LONGITUDE_DIRECTION             = EAST
CENTER_LATITUDE                          = 0.0000
CENTER_LONGITUDE                         = 338.7855
REFERENCE_LATITUDE                       = 'N/A'
REFERENCE_LONGITUDE                      = 'N/A'
X_AXIS_FIRST_PIXEL                       = 1
Y_AXIS_FIRST_PIXEL                       = 1
X_AXIS_LAST_PIXEL                        = 1024
Y_AXIS_LAST_PIXEL                        = 1024
MAP_PROJECTION_ROTATION                  = 0.0000
END_OBJECT
END
```

**3.2.2.10 DSMAPx[y] Label**

In the following label, x is C(compressed mosaic) F (full mosaic), or P (polar mosaic), y is 1, 2, 3 or not present.

NOTE

DSMAPF are pointed to by the framelet labels

```
OBJECT                                   = DATA_SET_MAP_PROJECT_
                                           CATALOG
 DATA_SET_ID                             = 'MGN-V-RDRS-5-MIDR-FULL-RES-
                                           V1.0'
OBJECT                                   = DS_MAP_PROJECT_INFO_CATALOG
 MAP_PROJECTION_TYPE                     = 'SINUSOIDAL'
 MAP_PROJECTION_DESC                        = "F-MIDRs are presented in a
              sinusoidal equal-area map projection. In this projection, parallels of latitude
              are straight lines, with constant distances between equal latitude intervals.
              Lines of constant longitude on either side of the projection meridian are curved
              since longitude intervals decrease with the cosine of latitude to account for
              their convergence toward the poles. This projection offers a number of
              advantages for storing and managing global digital data; in particular, it is
              computationally simple, and data are stored in a compact form.

               The sinusoidal equal-area projection is characterized by a projection longitude,
              which is the center meridian of the projection, and a scale, which is given in
              units of pixels/degree. The center latitude for all F-MIDRs is the equator. An
              F-MIDR is divided into an array of 56 framelets, each of which is 1024 lines by
              1024 samples. Each framelet is projected with the same projection longitude
```

and scale so that the entire F-MIDR can be reconstructed by simply concatenating the framelets.

The transformation from latitude and longitude to line and sample is given by the following equations.

line = SPECLINE - lat*SCALE + 1

sample = PROJSAMP + (lon - PROJ_LON)*SCALE*cos(lat) + 0.5

SCALE = (2*PI*6051000)/(PIXSIZ*360)

Note that integral values of line and sample correspond to the center of a pixel. Lat and lon are the latitude and longitude of a given spot on the surface. The other parameters in these equations are the names of keywords in the VICAR2 labels associated with each image. These parameters can also be found in the PDS labels of the image, but with different names. The values of parameters in the VICAR2 and PDS labels correspond to a given framelet. Thus, the computed line and sample relate to the framelet. The same equations, however, can be used for determining line and sample within a reconstructed F-MIDR by using the values of the above parameters in the label of the first framelet, which is the one in the upper left corner of the F-MIDR. The definitions of the VICAR2 keywords are given below. The equivalent PDS keyword name is shown in parentheses.

SPECLINE (X_AXIS_PROJECTION_OFFSET) is the line number minus one on which the map projection origin occurs. The map projection origin is the intersection of the equator and the projection longitude. The value of SPECLINE is positive for images starting north of the equator and is negative for images starting south of the equator.

PROJSAMP (Y_AXIS_PROJECTION_OFFSET) is the nearest sample number to the left (west) of the projection longitude. The value of PROJSAMP is positive for images starting to the west of the projection longitude and is negative for images starting to the east of the projection longitude.

PROJ_LON (CENTER_LONGITUDE) is the value of the projection longitude, which is the longitude that passes through the center of the projection.

PIXSIZ (MAP_SCALE) is the pixel spacing on the planet. The value in the VICAR2 label is in units of meters/pixel. PIXSIZ is 75 meters/pixel for all F-MIDRs.

There are several additional parameters in the VICAR2 and PDS labels that relate to the map projections. Those parameters that relate to sinusoidal projections or the framelet numbering are discussed below. Definitions for the remaining parameters can be found in the MIDR Software Interface Specification document or the PDS Data Dictionary.

There are eight VICAR2 parameters and four PDS parameters that specify the latitude and longitude boundaries of an image. LAT_UL and LAT_UR (both translate to MAXIMUM_LATITUDE in the PDS label) are the latitude of the center of the upper leftmost and rightmost pixel, respectively. LAT_LL and

LAT_LR (both translate to MINIMUM_LATITUDE in the PDS label) are the latitude of the center of the lower leftmost and rightmost pixel, respectively. LON_UR and LON_LR (the larger of which translates to MAXIMUM_LONGITUDE in the PDS label) are the longitude of the center of the upper and lower rightmost pixel, respectively. LON_UL and LON_LL (the smaller of which translates to MINIMUM_LONGITUDE in the PDS label) are the longitude of the center of the upper and lower leftmost pixel, respectively.

The keyword SUBF_COL (Y_AXIS_FRAMELET_OFFSET) is the column number of a framelet, which can have a value of 1 to 8. The keyword SUBF_ROW (X_AXIS_FRAMELET_OFFSET) is the row number of a framelet, which can have a value of 1 to 7. The MAP_RESOLUTION keyword in the PDS label is the value of SCALE given in the third equation above."

```
ROTATIONAL_ELEMENT_DESC          = "See DAVIESETAL1989."

OBJECT                           = DS_MAP_PROJ_REF_INFO_
                                   CATALOG
 REFERENCE_KEY_ID                = 'DAVIESETAL1989'
OBJECT                           = REFERENCE
 DOCUMENT_TOPIC_TYPE             = 'ROTATIONAL ELEMENTS OF THE
                                   PLANETS'
 JOURNAL_NAME                    = "CELESTIAL MECHANICS AND
                                   DYNAMICAL ASTRONOMY"
 PUBLICATION_DATE                = '1989'
 REFERENCE_DESC                  = "Davies, M.E., V.K. Abalakin, M.
                                   Bursa, G.E. Hunt, J.H. Lieske, B.
                                   Morando, R.H. Rapp, P.K. Seidelmann,
                                   A.T. Sinclair, and Y.S. Tjuflin, Report of
                                   the IAU/IAG/COSPAR working group on
                                   cartographic coordinates and rotational
                                   elements of the planets and satellites:
                                   1988, Celestial Mechanics and
                                   Dynamical Astronomy, 46, 187-204, 1989."
 OBJECT                          = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME                 = 'MERTON E. DAVIES'
 END_OBJECT                      = REFERENCE_AUTHORS_CATALOG
 OBJECT                          = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME                 = 'V. K. ABALAKIN'
 END_OBJECT                      = REFERENCE_AUTHORS_CATALOG
 OBJECT                          = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME                 = 'M. BURSA'
 END_OBJECT                      = REFERENCE_AUTHORS_CATALOG
 OBJECT                          = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME                 = 'G. E. HUNT'
 END_OBJECT                      = REFERENCE_AUTHORS_CATALOG
 OBJECT                          = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME                 = 'J. H. LIESKE'
 END_OBJECT                      = REFERENCE_AUTHORS_CATALOG
 OBJECT                          = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME                 = 'B. MORANDO'
 END_OBJECT                      = REFERENCE_AUTHORS_CATALOG
 OBJECT                          = REFERENCE_AUTHORS_CATALOG
```

```
AUTHOR_FULL_NAME              = 'R. H. RAPP'
  END_OBJECT                  = REFERENCE_AUTHORS_CATALOG
  OBJECT                      = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME              = 'P. K. SEIDELMANN'
  END_OBJECT                  = REFERENCE_AUTHORS_CATALOG
  OBJECT                      = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME              = 'A. T. SINCLAIR'
  END_OBJECT                  = REFERENCE_AUTHORS_CATALOG
  OBJECT                      = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME              = 'Y. S. TJUFLIN'
  END_OBJECT                  = REFERENCE_AUTHORS_CATALOG

 END_OBJECT                   = REFERENCE

END_OBJECT                    = DS_MAP_PROJ_REF_INFO_
                                CATALOG
OBJECT                        = DS_MAP_PROJ_REF_INFO_
                                CATALOG
 REFERENCE_KEY_ID             = 'SNYDER1987'

 OBJECT                       = REFERENCE
  DOCUMENT_TOPIC_TYPE         = 'MAP PROJECTION'
  JOURNAL_NAME                = 'N/A'
  PUBLICATION_DATE            = '1987'
  REFERENCE_DESC              = "Snyder, John P., Map projections -- a
                                working manual, U. S. Geol. Surv. Prof.
                                Paper 1395, 383p., 1987."
  OBJECT                      = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME              = 'JOHN P. SNYDER'
  END_OBJECT                  = REFERENCE_AUTHORS_CATALOG

 END_OBJECT                   = REFERENCE

END_OBJECT                    = DS_MAP_PROJ_REF_INFO_
                                CATALOG
OBJECT                        = DS_MAP_PROJ_REF_INFO_
                                CATALOG
 REFERENCE_KEY_ID             = 'LYONS1988'

 OBJECT                       = REFERENCE
  DOCUMENT_TOPIC_TYPE         = 'MAGELLAN PLANETARY
                                CONSTANTS AND MODELS'
  JOURNAL_NAME                = 'N/A'
  PUBLICATION_DATE            = '1988'
  REFERENCE_DESC              = "Lyons, D.T., Magellan Planetary
                                Constants and Models, JPL D-2300, Jet
                                Propulsion Laboratory, Pasadena, Calif.,
                                1988."
  OBJECT                      = REFERENCE_AUTHORS_CATALOG
AUTHOR_FULL_NAME              = 'D. T. LYONS'
  END_OBJECT                  = REFERENCE_AUTHORS_CATALOG

 END_OBJECT                   = REFERENCE
```

```
END_OBJECT          = DS_MAP_PROJ_REF_INFO_
                      CATALOG
END_OBJECT          = DS_MAP_PROJECT_INFO_CATALOG
END_OBJECT          = DATA_SET_MAP_PROJECT_
                      CATALOG
END
```

### 3.2.2.11 P-MIDR Label

TBD.

# Appendix A

## Recommended CD-ROM Drives and Driver Software

The following table lists drives and driver software IDPS has employed successfully on various systems using MIDR CD-ROMs.

| System | Drive | Driver | Comments |
|---|---|---|---|
| VAX/VMS | Digital Equipment Corp. (DEC) RRD40 or RRD50. | DEC VFS CD-ROM driver V4.7 or V5.2 and up. | The driver software may be obtained from Jason Hyon at JPL. It is necessary to use this driver to access the XARs on the CD-ROM. |
| VAX/Ultrix. | DEC RRD40 or RRD50 | Supplied with Ultrix 3.1. | Use the "cdio" software package (in "~ftp/src/cdio.shar" from the "space.mit.edu" server). Contact Dr. Peter Ford for details (see Appendix B below). |
| IBM PC | Toshiba, Hitachi, Sony, or compatible. | Microsoft MSCDEX version 2.2. | The newest version of MSCDEX (released in February 1990) is generally available. Contact Jason Hyon for assistance in locating a copy. |
| Apple Macintosh | Apple CD SC (Sony) or Toshiba. | Apple CD-ROM driver. | The Toshiba drive requires a separate driver, which may be obtained from Toshiba. |
| Sun Micro | Delta Microsystems SS-660 (Sony). | Delta Microsystems driver or SUN CD-ROM Driver. | For questions concerning this driver, contact Denis Down at Delta Microsystems, 415-449-6881. |

# Appendix B

## SUPPORT STAFF AND COGNIZANT PERSONS

## B.1 Support Staff

The following table lists the support staff according to the information required by the user.

| Information Required | Contact/Address |
|---|---|
| How to read the CD-ROM | Jason J. Hyon<br>MS 168-514<br>Jet Propulsion Laboratory<br>4800 Oak Grove Drive<br>Pasadena, CA 91109<br>818-354-7050<br><br>Electronic mail addresses:<br>SPAN: MIPL3::JJH345<br>Internet: jjh345@mipl3.jpl.nasa.gov<br>NASAmail: JHYON |
| IDPS products | Jerry Clark<br>MS 168-514<br>Jet Propulsion Laboratory<br>4800 Oak Grove Drive<br>Pasadena, CA 91109<br>818-354-3969 |

| Information Required | Contact/Address |
|---|---|
| Data products/documentation | Professor Raymond E. Arvidson<br>PDS Geosciences Node<br>Washington University<br>Campus Box 1169<br>St. Louis, MO 63130<br>314-889-5609<br><br>Electronic mail addresses:<br>SPAN: WURD::ARVIDSON<br>Internet: arvidson@wuddy.wustl.edu<br>NASAmail: RARVIDSON |

## B.2 Cognizant Persons

Cognizant persons are listed as follows:

Mike Martin (JPL), Gail Woodward (JPL), Peter Ford (MIT), Robert Mehlman (UCLA), and Jason Hyon (JPL) designed the PDS labels and the tables, with revisions from Edward Guinness and Susan Slavney.

Edward Guinness (Washington University), Kay Edwards (USGS), Eric Eliason (USGS) and Raymond Arvidson (Washington University) helped to develop the map projection keywords and tables.

Florence Moss (JPL) and Jason Hyon developed the software to generate the PDS labels and tables.

Raymond Arvidson and Gail Woodward created the catalog information files, with help from Pam Woncik (JPL), Edward Guinness (Washington University), Susan Slavney (Washington University), and Mary Dale-Bannister (Washington University).

The Magellan Project supplied the relevant data and information used to populate the files on the CD-ROMs.

Judy Mankin and Bob Canada at DADC designed the cover of the CD-ROMs.

# APPENDIX C

## LABEL SUBDIRECTORY

This appendix lists the content of the files in the label subdirectory. These files are fixed and are the same on all MIDR CD-ROMs.

### C.1 CATALOG.LBL

```
OBJECT                              = PARAMETER
INSTRUMENT_HOST_ID                  = 'MGN'
DATA_SET_PARAMETER_NAME             = 'RADAR SCALED BACKSCATTER
                                    CROSS SECTION'
INSTRUMENT_PARAMETER_NAME           = 'RADAR ECHO POWER'
IMPORTANT_INSTRUMENT_PARMS          = 1
END_OBJECT                          = PARAMETER

OBJECT                              = DSINSTPARMD
DATA_SET_OR_INSTRUMENT_PARM_NM      = 'RADAR SCALED BACKSCATTER
                                    CROSS SECTION'
DATA_SET_OR_INST_PARM_DESC          = "Cross section values that are scaled by
                                    some procedure, such as dividing by
                                    theoretical or empirical scattering laws."
END_OBJECT                          = DSINSTPARMD

OBJECT                              = DSINSTPARMD
DATA_SET_OR_INSTRUMENT_PARM_NM      = 'RADAR ECHO POWER'
DATA_SET_OR_INST_PARM_DESC          = "That part of the transmitted power
                                    scattered by the target and received by
                                    the radar antenna."
END_OBJECT                          = DSINSTPARMD

OBJECT                              = DSINSTPARMD
DATA_SET_OR_INSTRUMENT_PARM_NM      = 'RADIANT POWER'
DATA_SET_OR_INST_PARM_DESC          = "Emitted power that is received by the
                                    radar antenna."
END_OBJECT                          = DSINSTPARMD

OBJECT                              = DSPROCESSING
SOURCE_DATA_SET_ID                  = 'MGN-V-RDRS-2-EDR-SAR-V1.0'
SOFTWARE_NAME                       = 'SDPS'
PRODUCT_DATA_SET_ID                 = 'MGN-V-RDRS-5-BIDR-FULL-RES-
                                    V1.0'
END_OBJECT                          = DSPROCESSING

OBJECT                              = DSPROCESSING
SOURCE_DATA_SET_ID                  = 'MGN-V-RDRS-5-BIDR-FULL-RES-
                                    V1.0'
SOFTWARE_NAME                       = 'IDPS'
PRODUCT_DATA_SET_ID                 = 'MGN-V-RDRS-5-BIDR-
COMPRESSED-V1.0'
END_OBJECT                          = DSPROCESSING
```

```
OBJECT                          = DSPROCESSING
SOURCE_DATA_SET_ID              = 'MGN-V-RDRS-5-BIDR-
                                  COMPRESSED-V1.0'
SOFTWARE_NAME                   = 'IDPS'
PRODUCT_DATA_SET_ID             = 'MGN-V-RDRS-5-MIDR-C1-V1.0'
END_OBJECT                      = DSPROCESSING

OBJECT                          = DSPROCESSING
SOURCE_DATA_SET_ID              = 'MGN-V-RDRS-5-MIDR-C1-V1.0'
SOFTWARE_NAME                   = 'IDPS'
PRODUCT_DATA_SET_ID             = 'MGN-V-RDRS-5-MIDR-C2-V1.0'
END_OBJECT                      = DSPROCESSING

OBJECT                          = DSPROCESSING
SOURCE_DATA_SET_ID              = 'MGN-V-RDRS-5-MIDR-C2-V1.0'
SOFTWARE_NAME                   = 'IDPS'
PRODUCT_DATA_SET_ID             = 'MGN-V-RDRS-5-MIDR-C3-V1.0'
END_OBJECT                      = DSPROCESSING

OBJECT                          = DSPROCESSING
SOURCE_DATA_SET_ID              = 'MGN-V-RDRS-5-BIDR-FULL-RES-
                                  V1.0'
SOFTWARE_NAME                   = 'IDPS'
PRODUCT_DATA_SET_ID             = 'MGN-V-RDRS-5-MIDR-FULL-RES-
                                  V1.0'
END_OBJECT                      = DSPROCESSING

OBJECT                          = DSPROCESSING
SOURCE_DATA_SET_ID              = 'MGN-V-RDRS-5-BIDR-
                                  COMPRESSED-V1.0'
SOFTWARE_NAME                   = 'IDPS'
PRODUCT_DATA_SET_ID             = 'MGN-V-RDRS-5-MIDR-N-POLAR-
                                  STEREOGR-V1.0'
END_OBJECT                      = DSPROCESSING

OBJECT                          = SOFTWARE
SOFTWARE_NAME                   = 'SDPS'
NODE_ID                         = 'N/A'
SOFTWARE_RELEASE_DATE           = 'N/A'
SOFTWARE_TYPE                   = 'N/A'
COGNIZANT_FULL_NAME             = 'SDPT'
SOFTWARE_ACCESSIBILITY_DESC     = 'N/A'
SOFTWARE_DESC                   = "The SAR Data Processing Subsystem
                                  (SDPS) consists of a suite of specialized
                                  routines to conduct range and Doppler
                                  compression of the radar signal, look
                                  summation, and remapping from range-
                                  Doppler to sinusoidal equal area map
                                  coordinates."
END_OBJECT                      = SOFTWARE

OBJECT                          = SOFTWARE
SOFTWARE_NAME                   = 'IDPS'
```

```
NODE_ID                              = 'N/A'
SOFTWARE_RELEASE_DATE                = 'N/A'
SOFTWARE_TYPE                        = 'N/A'
COGNIZANT_FULL_NAME                  = 'IDPT'
SOFTWARE_ACCESSIBILITY_DESC          = 'N/A'
SOFTWARE_DESC                        = "The Image Data Processing Subsystem
                                       (IDPS) consists of a suite of VICAR
                                       routines, augmented with specialized
                                       modules, to ingest F-BIDRs, produce C-
                                       BIDRs, and generate MIDRs."
END_OBJECT                           = SOFTWARE

OBJECT                               = MISSION
 MISSION_NAME                        = 'MAGELLAN'

 OBJECT                              = MSNINFO
  MISSION_START_DATE                 = '1989-05-04'
  MISSION_STOP_DATE                  = 'UNK'
  MISSION_ALIAS_NAME                 = 'Venus Radar Mapper (VRM)'
  MISSION_DESC                       = "The Magellan spacecraft was
```

launched from the Kennedy Space Center on May 4, 1989. The spacecraft was deployed from the Shuttle cargo bay after the Shuttle achieved parking orbit. Magellan, using an inertial upper stage rocket, was then placed into a Type IV transfer orbit to Venus.

Magellan is powered by single degree of freedom, sun-tracking, solar panels. The spacecraft is 3-axis stabilized by reaction wheels using gyros and a star sensor for attitude reference. The spacecraft carried a solid rocket motor for Venus orbit insertion. A small hydrazine system provides trajectory corrections and certain attitude control functions. Earth communication with the Deep Space Network (DSN) is by means of S and X-band channels. The high-gain antenna also functions as the SAR mapping antenna during orbital operations.

The interplanetary cruise phase lasted until August 10, 1990. During the cruise phase there were small trajectory correction maneuvers to insure proper approach geometry. Using the solid rocket motor, the spacecraft was placed in an elliptical orbit around the planet, with a periapsis latitude of approximately 10 degrees North, a periapsis altitude of 294 km, and a period of 3.263 hours. Apoapsis altitude is approximately 7762 km.

After orbit insertion, the radar system acquired test data and then within days the signal from the spacecraft was lost twice. Placed in a 'Safe Mode', the spacecraft resumed mapping operations on September 15, 1990, after commands were relayed to avoid further communication losses.

The first mapping cycle lasts 243 days, which is the time required for Venus to make one rotation under the spacecraft orbit. Typical activities during a single mapping pass are as follows. As the spacecraft nears the planet surface, the spacecraft is oriented so the high-gain antenna points slightly to the side of the ground track. At a true anomaly of -59 degrees, the radar is commanded on. The radar continues to take data to a true anomaly of 80 degrees and then the radar is commanded off. On the next pass the swath starts at -80 degrees and goes to 59 degrees. Alternating north and south swaths are repeated.

The range of latitude covered by the radar is 67 degrees S to 90 degrees N. The range of look angles for the SAR is 13 degrees to 44 degrees from nadir. The SAR data are taken at a data rate of 750 kb/s and are stored in the spacecraft tape recorder. Altimeter and radiometer data are also taken whenever the radar is operating. The altimeter data are taken using the small fan beam antenna and a data rate of 30 kb/s.

As the spacecraft moves away from the planet toward apoapsis, the spacecraft reorients the high-gain antenna towards Earth and the stored radar data are transmitted to DSN stations on Earth. This data taking- and transmitting-cycle is repeated every orbit revolution. After 243 days the planet is completely mapped except for gaps and the area near the South Pole.

On Earth, the SAR, altimeter and radiometer data are processed into images and maps for scientific study."

MISSION_OBJECTIVES_SUMMARY = "VOLCANIC AND TECTONIC PROCESSES. U.S. Earth-based and the Soviet Venera 15/16 radar images of the Venus surface show widespread evidence for volcanic activity. A major goal of the Magellan mission is to provide a detailed global characterization of volcanic landforms on Venus and an understanding of the mechanics of volcanism in the Venus context. Of particular interest is the role of volcanism in transporting heat through the lithosphere. While this goal will largely be accomplished by a careful analysis of images of volcanic features and of the geological relationships of these features to tectonic and impact structures, an essential aspect of characterization will be an integration of image data with altimetry and other measurements of surface properties.

Explosive pyroclastic volcanism should not occur in the present Venus environment, unless the magma contains amounts of volatiles that are large by terrestrial experience. Thus, evidence for extensive pyroclastic deposits would imply the presence of large amounts of volatiles or, if the deposits are old, may suggest historic changes in atmospheric density. Such ideas will be tested using SAR and altimetry data, combined with knowledge of the local geopotential field and may shed light on magma dynamics. Measurements of longitudinal and transverse slope, flow margin relief, and flow surface relief will also provide powerful constraints on flow models, as well as on the rheological properties and physical state of the lava.

A parallel goal is the global characterization of tectonic features on Venus and an appreciation of the tectonic evolution of the planet. This goal addresses issues on several scales. On the scale of individual tectonic features, we are interested in the mechanical nature of the faulting process, the documentation of geometry and sense of fault slip, and the relationship between mechanical and thermal properties of the lithosphere. On a somewhat broader scale, we are interested in linking groups of features to specific processes (e.g., uplift, orogeny, gravity sliding, flexure, compression or extension of the lithosphere) and in testing quantitative models for these processes with SAR images and supporting topographic, gravitational, and surface compositional data. On a global scale, we are interested in whether spatially coherent, large-scale patterns in tectonic behavior are discernible, patterns that might be related to an organized system of plates or to mantle convective flow.

IMPACT PROCESSES. The final physical form of an impact crater has meaning only when the effects of the cratering event and any subsequent modification of the crater can be distinguished. To this end, a careful search of the SAR images will attempt to locate and document both relatively pristine and degraded impact craters, together with their ejecta deposits, in each size range, as well as to distinguish impact craters from those of volcanic origin. The topographic measures of depth-to-diameter ratio, ejecta thickness distribution as a function of distance from the crater, and the relief of central peaks will contribute to this documentation.

It is expected that several time-dependent processes will influence the change in appearance of craters with increasing crater age, including continued bombardment of the surface, variations in the mechanical properties of the lithosphere (as a result of cooling or loss of near-surface volatiles), horizontal deformation of the lithosphere, possible variations in the mass of the atmosphere, volcanism, and finally, surface erosion and deposition. Distinguishing and understanding these processes constitute important components of the study of crater morphology.

Beyond their intrinsic interest in providing a record of impact and deformational processes, craters provide a tool for the relative dating of surface geological units. Relative ages can be established from a comparison of the variations in the areal density of craters of a given size as well as from a comparison of the maximum extent to which different craters are degraded. Together with superpositional relationships (a lava flow that covers an older fault) and transectional relationships (a graben that cuts through an older volcano), the relative temporal evolution of large areas of the Venus surface can be reconstructed.

EROSIONAL, DEPOSITIONAL, AND CHEMICAL PROCESSES. The nature of erosional and depositional processes on Venus is poorly known, primarily because of the diagnostic landforms typically occur at a scale too small to have been resolved in Earth-based or Venera 15/16 radar images. Magellan images will be carefully examined for evidence of such processes, including wind eroded terrains, landforms produced by deposition (dune fields), landslides and other down slope movements, as well as aeolian features such as radar bright or dark streaks 'downwind' from prominent topographic anomalies. One measure of weathering, erosion, and deposition is provided by the extent to which soil covers the surface (for Venus, the term soil is used for porous material, as implied by its relatively low value of bulk dielectric constant). The existence of such material, and its dependence on elevation and geologic setting, provide important insights into the interactions that have taken place between the atmosphere and the lithosphere.

Because of the inference drawn from the deuterium-to-hydrogen ratio of the present atmosphere for the past existence of substantial amounts of water on Venus, the images will also be searched for evidence of past episodes of fluvial activity (drainage systems) and for lake beds and coastal signatures (strandlines).

The existence of a thick and cloudy atmosphere precludes infrared, visual, ultraviolet, x-ray, or gamma-ray observation of the Venus surfaces from orbit. Thus it is impossible to obtain information on a global basis about the surface composition of mineralogy using standard remote-sensing techniques. Radar and radio observation of Venus from the Earth, and from the Pioneer Venus and Venera 15/16 orbiters, have disclosed that very often the surfaces of elevated regions possess both anomalously high values of normal-incidence radar reflectivity, occasionally exceeding 0.43, and associated low values of radio emissivity, reaching as low as 0.50. In the absence of liquid water, which is known from a variety of evidence not to be present today on Venus, it is necessary to assume a surface composition that would be unusual in terrestrial experience to explain the large values of dielectric constant implied by these observations. The most acceptable of the current hypotheses requires a significant number of electrically conducting elements in surface materials. If these are iron sulfides, as some chemical evidence suggests, they may possibly be brought to the surface by volcanic activity. The good spatial resolution of the Magellan instrumentation, both in determining the surface reflectivity from the altimetric observations and in measuring the emissivity from radiometric observations, promises to outline the structure of these regions in far greater detail than is now available and may shed light on their origin. Results will be applied to testing hypotheses for regional and global buffering of atmospheric composition by reactions with crustal materials.

ISOSTATIC AND CONVECTIVE PROCESSES. Topography and gravity are intimately and inextricably related, and must be jointly examined when undertaking geophysical investigations of the interior of a planet, where isostatic and convective processes dominate. Topography provides a surface boundary condition for modeling the interior density of Venus.

Modeling of the interior density using gravity data is, of course, nonunique. Meaningful interpretation rests on integrating other data sets and/or incorporating specific mechanical models of the interior. For example, a single density interface underlying the known topography can be found that exactly matches any observed gravity field. The interface can be at any depth; the greater the depth, the larger the density contrast needed.

The thickness of the elastic lithosphere of Venus, i.e., the outer region of the planet that behaves elastically over geologically long periods of time, is of special interest. The base of this zone is likely to be defined by a specific isotherm whose location depends on the particular temperature-dependent flow or creep properties of the material underneath. If this isotherm can be mapped in space and time, then models for the thermal evolution of the planet can be developed.

The key to determining lithospheric thickness variations in space and time is through flexure studies. If a mass load, e.g., a shield volcano or a mascon, is placed on the planetary surface, then the elastic lithosphere will flex under the load. The controlling parameter is the flexural rigidity, which is dependent on the elastic constants and lithospheric thickness.

Crucial to applying estimates of flexural rigidity to the task of unraveling the thermal history is an estimate of when the load was emplaced. Thus age determinations derived by various geologic techniques are essential to this scheme."

OBJECT = MSNPHSINFO

```
SPACECRAFT_ID                      = 'MGN'
TARGET_NAME                        = 'VENUS'
MISSION_PHASE_TYPE                 = 'PRELAUNCH'
SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
MISSION_PHASE_START_TIME           = '1988-09-01'
MISSION_PHASE_STOP_TIME            = '1989-05-04'
MISSION_PHASE_DESC                 = "The prelaunch phase extended from
                                     delivery of the spacecraft to Kennedy
                                     Space Center until the start of the launch
                                     countdown."
END_OBJECT                         = MSNPHSINFO

OBJECT                             = MSNPHSINFO
SPACECRAFT_ID                      = 'MGN'
TARGET_NAME                        = 'VENUS'
MISSION_PHASE_TYPE                 = 'LAUNCH'
SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
MISSION_PHASE_START_TIME           = '1989-05-04'
MISSION_PHASE_STOP_TIME            = '1989-05-04'
MISSION_PHASE_DESC                 = "The launch phase extended from the
                                     start of launch countdown until
                                     completion of the injection into Earth-
                                     Venus trajectory."
END_OBJECT                         = MSNPHSINFO

OBJECT                             = MSNPHSINFO
SPACECRAFT_ID                      = 'MGN'
TARGET_NAME                        = 'VENUS'
MISSION_PHASE_TYPE                 = 'CRUISE'
SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
MISSION_PHASE_START_TIME           = '1989-05-04'
MISSION_PHASE_STOP_TIME            = '1990-08-01'
MISSION_PHASE_DESC                 = "The cruise phase extended from
                                     injection into an Earth-Venus trajectory
                                     until Venus orbit insertion minus 10 days."
END_OBJECT                         = MSNPHSINFO

OBJECT                             = MSNPHSINFO
SPACECRAFT_ID                      = 'MGN'
TARGET_NAME                        = 'VENUS'
MISSION_PHASE_TYPE                 = 'ORBIT INSERTION'
SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
MISSION_PHASE_START_TIME           = '1990-08-01'
MISSION_PHASE_STOP_TIME            = '1990-08-10'
MISSION_PHASE_DESC                 = "The Venus orbit insertion phase
                                     extended from Venus orbit insertion minus
                                     10 days until burnout of the solid rocket
                                     injection motor."
END_OBJECT                         = MSNPHSINFO

OBJECT                             = MSNPHSINFO
SPACECRAFT_ID                      = 'MGN'
TARGET_NAME                        = 'VENUS'
```

```
MISSION_PHASE_TYPE                 = 'ORBIT CHECKOUT'
SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
MISSION_PHASE_START_TIME           = '1990-08-10'
MISSION_PHASE_STOP_TIME            = '1990-09-15'
MISSION_PHASE_DESC                 = "Orbit trim and checkout phase
                                   extended from burnout of the solid rocket
                                   injection motor until beginning of the
                                   mapping."
END_OBJECT                         = MSNPHSINFO

OBJECT                             = MSNPHSINFO
SPACECRAFT_ID                      = 'MGN'
TARGET_NAME                        = 'VENUS'
MISSION_PHASE_TYPE                 = 'MAPPING CYCLE 1'
SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
MISSION_PHASE_START_TIME           = '1990-09-15'
MISSION_PHASE_STOP_TIME            = '1991-05-16'
MISSION_PHASE_DESC                 = "The first mapping cycle extends from
                                   completion of the orbit trim and checkout
                                   phase until completion of one cycle of
                                   mapping (approximately 243 days)."
END_OBJECT                         = MSNPHSINFO

OBJECT                             = MSNPHSINFO
SPACECRAFT_ID                      = 'MGN'
TARGET_NAME                        = 'VENUS'
MISSION_PHASE_TYPE                 = 'MAPPING CYCLE 2'
SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
MISSION_PHASE_START_TIME           = 'TBD'
MISSION_PHASE_STOP_TIME            = 'TBD'
MISSION_PHASE_DESC                 = "The second mapping cycle extends from
                                   completion of the first mapping cycle
                                   until completion of one cycle of mapping
                                   (approximately 243 days)."
END_OBJECT                         = MSNPHSINFO

OBJECT                             = MSNPHSINFO
SPACECRAFT_ID                      = 'MGN'
TARGET_NAME                        = 'VENUS'
MISSION_PHASE_TYPE                 = 'MAPPING CYCLE 3'
SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
MISSION_PHASE_START_TIME           = 'TBD'
MISSION_PHASE_STOP_TIME            = 'TBD'
MISSION_PHASE_DESC                 = "The third mapping cycle extends from
                                   completion of the second mapping cycle
                                   until completion of one cycle of mapping
                                   (approximately 243 days)."
END_OBJECT                         = MSNPHSINFO

OBJECT                             = MSNPHSINFO
SPACECRAFT_ID                      = 'MGN'
TARGET_NAME                        = 'VENUS'
MISSION_PHASE_TYPE                 = 'MAPPING CYCLE 4'
```

```
    SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
    MISSION_PHASE_START_TIME           = 'TBD'
    MISSION_PHASE_STOP_TIME            = 'TBD'
    MISSION_PHASE_DESC                 = "The fourth mapping cycle extends from
                                         completion of the third mapping cycle
                                         until completion of one cycle of mapping
                                         (approximately 243 days)."
  END_OBJECT = MSNPHSINFO

  OBJECT                               = MSNPHSINFO
   SPACECRAFT_ID                       = 'MGN'
   TARGET_NAME                         = 'VENUS'
    MISSION_PHASE_TYPE                 = 'MAPPING CYCLE 5'
    SPACECRAFT_OPERATIONS_TYPE         = 'ORBITER'
    MISSION_PHASE_START_TIME           = 'TBD'
    MISSION_PHASE_STOP_TIME            = 'TBD'
    MISSION_PHASE_DESC                 = "The fifth mapping cycle extends from
                                         completion of the fourth mapping cycle
                                         until completion of one cycle of mapping
                                         (approximately 243 days)."
  END_OBJECT = MSNPHSINFO

END_OBJECT                             = MSNINFO

OBJECT                                 = MSNREFINFO
 REFERENCE_KEY_ID                      = 'SAUNDERSETAL1990'

 OBJECT                                = REFERENCE
  DOCUMENT_TOPIC_TYPE                  = 'MISSION SCIENCE'
  JOURNAL_NAME                         = 'JOURNAL OF GEOPHYSICAL
                                         RESEARCH'
  PUBLICATION_DATE                     = '1990'
  REFERENCE_DESC                       = "Saunders, R.S., G.H. Pettengill, R.E.
                                         Arvidson, W.L. Sjogren, W.T.K. Johnson,
                                         L. Pieri, The Magellan Venus Radar
                                         Mapping Mission, Journal of Geophysical
                                         Research, 95, 8339-8355, 1990."
  OBJECT                               = REFAUTHORS
   AUTHOR_FULL_NAME                    = 'R. STEPHEN SAUNDERS'
  END_OBJECT                           = REFAUTHORS

  OBJECT                               = REFAUTHORS
   AUTHOR_FULL_NAME                    = 'GORDON H. PETTENGILL'
  END_OBJECT                           = REFAUTHORS

  OBJECT                               = REFAUTHORS
   AUTHOR_FULL_NAME                    = 'RAYMOND E. ARVIDSON'
  END_OBJECT                           = REFAUTHORS

  OBJECT                               = REFAUTHORS
   AUTHOR_FULL_NAME                    = 'W. L. SJOGREN'
  END_OBJECT                           = REFAUTHORS
```

```
    OBJECT                          = REFAUTHORS
     AUTHOR_FULL_NAME               = 'WILLIAM T. K. JOHNSON'
    END_OBJECT                      = REFAUTHORS

    OBJECT                          = REFAUTHORS
     AUTHOR_FULL_NAME               = 'LESLIE J. PIERI'
    END_OBJECT                      = REFAUTHORS

   END_OBJECT                       = REFERENCE

  END_OBJECT                        = MSNREFINFO

  OBJECT                            = MSNREFINFO
   REFERENCE_KEY_ID                 = 'VRMPP1983'

   OBJECT                           = REFERENCE
    DOCUMENT_TOPIC_TYPE             = 'MAGELLAN PROJECT DOCUMENT'
    JOURNAL_NAME                    = 'N/A'
    PUBLICATION_DATE                = '1983'
```

```
  REFERENCE_DESC                 = "Venus Radar Mapper Project Plan,
                                 Document 630-1, JPL D-814, 157 pp., Jet
                                 Propulsion Laboratory, Pasadena, Calif.,
                                 1983."
OBJECT                           = REFAUTHORS
 AUTHOR_FULL_NAME                = 'N/A'
END_OBJECT                       = REFAUTHORS

 END_OBJECT                      = REFERENCE

 END_OBJECT                      = MSNREFINFO

 OBJECT                          = MSNREFINFO
  REFERENCE_KEY_ID               = 'PETTENGILL1988'

 OBJECT                          = REFERENCE
  DOCUMENT_TOPIC_TYPE            = 'MAGELLAN PROJECT DOCUMENT'
  JOURNAL_NAME                   = 'N/A'
  PUBLICATION_DATE               = '1988'
  REFERENCE_DESC                 = "Pettengill, G. H., Magellan Venus
                                 Radar Mapper Science Experiment Plan
                                 of the Radar Investigation Group
                                 (RADIG), MIT/JPL."
  OBJECT                         = REFAUTHORS
AUTHOR_FULL_NAME                 = 'G. H. PETTENGILL'
  END_OBJECT                     = REFAUTHORS
 END_OBJECT                      = REFERENCE
 END_OBJECT                      = MSNREFINFO

 OBJECT                          = MSNREFINFO
  REFERENCE_KEY_ID               = 'PETTENGILL1991'
 OBJECT                          = REFERENCE
  DOCUMENT_TOPIC_TYPE            = 'MAGELLAN: MISSION SUMMARY'
  JOURNAL_NAME                   = 'SCIENCE'
  PUBLICATION_DATE               = '1991'
  REFERENCE_DESC                 = "Pettengill, G. H., Saunders, R. S.,
                                 Magellan: Mission Summary, Science, V.
                                 252, pp. 247 - 249, 1991"
  OBJECT                         = REFAUTHORS
AUTHOR_FULL_NAME                 = 'G. H. PETTENGILL'
  END_OBJECT                     = REFAUTHORS
  OBJECT                         = REFAUTHORS
AUTHOR_FULL_NAME                 = 'R. S. SAUNDERS'
  END_OBJECT                     = REFAUTHORS
 END_OBJECT                      = REFERENCE
 END_OBJECT                      = MSNREFINFO
END_OBJECT                       = MISSION

OBJECT                           = SPACECRAFT
 SPACECRAFT_ID                   = 'MGN'

 OBJECT                          = SCINFO
  LAUNCH_DATE                    = '1989-05-04'
```

INSTRUMENT_HOST_NAME = 'MAGELLAN'
INSTRUMENT_HOST_TYPE = 'SPACECRAFT'
SPACECRAFT_DESC = "The design of the Magellan spacecraft was driven by the need for a low-cost, high-performance vehicle. Some of the Magellan spacecraft components were already in existence or at least designed. Protoflight spacecraft were available from storage at no cost. These include the 3.7 meter diameter, high-gain antenna (HGA), the spacecraft bus, propulsion system components, thermal control louvers, and much of the radio subsystem. The stockpile of flight spares for the Galileo spacecraft provided Magellan's command and data system, tape recorders, attitude control processor, power subsystem and propulsion components. Further elements were drawn from other projects and from NASA standard designs. Only about 30% (by mass) of the Magellan spacecraft was especially designed for the mission, primarily the radar electronics and the solar panels.

The spacecraft system was built by Martin Marietta Corporation. The spacecraft system is composed of the structure, thermal control, power, attitude control, propulsion, command data and data storage, and telecommunications subsystems. The spacecraft structure is composed of four major sections: High-Gain Antenna (HGA), Forward Equipment Module (FEM), Spacecraft Bus (including the solar array), and the Orbit Insertion Stage.

The High-Gain antenna is used as the antenna for the SAR and as the primary antenna for the telecommunications system.

The radar electronics, the reaction wheels, and various other spacecraft subsystem components are contained within the Forward Equipment Module, located between the bay and the HGA.

The spacecraft bus is a ten sided structure that contains remainder of the spacecraft subsystem components including the solar panel array, star scanner, medium-gain antenna (MGA), rocket engine modules (REMs), command, data and data storage (CDDS) subsystem, attitude control monopropellant tank, and a nitrogen tank for providing propellant pressurization.

The orbit insertion stage contains a STAR-48 solid rocket motor (SRM) that is used to provide the impulse required to perform the Venus Orbit Insertion (VOI) maneuver.

Thermal control of the spacecraft is accomplished by a combination of louvers, thermal blankets, passive coatings, and heat dissipating elements. The nominal operating temperature for the spacecraft components is between -5 and +40 degrees Centigrade. The thermal control subsystem maintains these components at the appropriate temperatures for all orientations of the spacecraft orbit and sun-line and for all spacecraft operating modes. Electrical power is supplied by two large solar panels with a total area of 12.6 square meters. This array is capable of producing a minimum power of 1029 W at the end of the nominal mission, and has a single degree of freedom about the solar array axis to allow tracking of the Sun despite the changing Earth-Sun-spacecraft geometry during the mission. A dedicated sun sensor optimizes power production. Bus voltage regulation is controlled by the power control unit (PCU) with a shunt regulator for diverting excess power from the solar arrays to maintain power as raw power (28-35 v), regulated power at 28 vDC +/-0.56

vDC, and as AC at 2.4 KHz through the inverter. Two 30 amp-hour, 26-cell nickel cadmium batteries provide power during times of solar occultation, and allow normal spacecraft operations independent of real-time solar illumination. These batteries are sized to allow a degraded mission in the event that one of them fails.

The attitude of the Magellan spacecraft is controlled through the use of reaction wheels, with monopropellant rocket motors being used to periodically desaturate the reaction wheels. During both the interplanetary cruise and the orbital portions of the mission, attitude reference is provided by an inertial reference unit (IRU) which is updated each orbit using celestial references. During the mapping phase of the orbit, the spacecraft is initially oriented with the HGA pointing down toward Venus, with the exact attitude being a function of the spacecraft altitude. During the downlink transmission phase of the orbit, the spacecraft is oriented with the HGA slightly off the Earth-line. The low gain antenna (LGA) is mounted coaxially with the HGA and does not require pointing since it has an omnidirectional beam pattern. The altimeter horn (ALTA) has been positioned so that a portion of the fan-shaped beam always points in the nadir direction during the mapping phase of an orbit.

The Magellan propulsion subsystem consists of two parts. The first, a Star 48 SRM, provides the impulse for VOI. Following that maneuver, the empty casing and parts of its support structure were ejected from the spacecraft. The second part consists of monopropellant hydrazine thrusters that were used for trajectory correction maneuvers (TCMs) during interplanetary cruise, thrust vector control (TVC) during VOI, orbit trim maneuvers during the mapping mission, and attitude control when the action wheels are being desaturated. The rocket motors are clustered in modules located on the end of outrigger booms in order to increase their moment arm and thus decrease attitude control propellant requirements.

Twelve 0.9-N (Newton) and four 22-N rocket motors are used for attitude control, with thrust being provided by eight 445-N rocket motors or by the 0.9-N motors for small TCMs. All engines point in the -Z direction, with the exception of the roll motors.

The 0.9-N motors were used for tip-off control following separation of the inertial upper stage (IUS), reaction wheel desaturation, roll control for all times other than VOI, to back up any failed reaction wheels, and for small TCMs or orbit trim maneuvers (OTMs). The 22-N motors were used for roll control during VOI. The 445-N motors were used for controlling the spacecraft rotational axis during VOI, and to provide impulses during all propulsive maneuvers. The monopropellant motors also provided the impulses needed to trim the VOI maneuver.

The command, data and data storage (CDDS) system is responsible for receiving uplink commands via the radio frequency subsystem (RFS) and controlling the spacecraft in response to those commands. It is also responsible for controlling the acquisition and storage of scientific data and sending that data, along with supplemental engineering data, to the RFS for downlink transmission to Earth. The commands are sent to the spacecraft as time-event pairs for storage and later execution, and also in the form of blocks which the CDDS later expands into spacecraft executable commands. In the Venus orbit phase, commands for up to three days of radar operations are stored. The provision also exists to receive and execute discrete commands sent up from the ground. Engineering data is nominally transmitted to Earth over a real-time S-band link. During those times when real-time link is not possible, the data is tape recorded and played back via the X-band high-rate link. The SAR data are nominally stored on two multi-track digital tape records (DTRs) for later playback over the high-rate X-band link. There is no provision for real-time transmission of the SAR data. Data storage capacity of the two DTRs is approximately 1.8 billion bits. These DTRs are primarily used for recording SAR data, although low-rate engineering data can be stored on these devices, interleaved with the SAR data, during times when those data cannot be transmitted to Earth over a real-time link. The recorded data stream will alternately be switched between these two DTRs so that the data will not be lost during the DTR track change.

The Magellan telecommunications subsystem contains all the hardware necessary to maintain communications between Earth and the spacecraft. The subsystem contains the radio frequency subsystem, the LGA, MGA, and HGA. The RFS performs the functions of carrier transponding, command detection and decoding, and telemetry modulation. The spacecraft is capable of simultaneous X-band and S- band uplink and downlink operations. The S-band operates at a transmitter power of 5 W, while the X-band operates at a power of 22W. Uplink data rates are 31.25 and 62.5 bps (bits per second) with downlink data rates of 40 bps (emergency only), 1200 bps (real-time engineering rate), 115.2 kbps (kilobits per second) (radar downlink backup), and 268.8 kbps (nominal)."

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 END_OBJECT                               = SCINFO

 OBJECT                                   = PLATFORM
  PLATFORM_OR_MOUNTING_NAME               = 'SPACECRAFT'
  PLATFORM_OR_MOUNTING_DESC               = "The radar system is mounted onto the
                                          spacecraft."
 END_OBJECT                               = PLATFORM


 OBJECT                                   = SCREFINFO
  REFERENCE_KEY_ID                        = 'SAUNDERSETAL1990'
 END_OBJECT                               = SCREFINFO
END_OBJECT                                = SPACECRAFT

OBJECT                                    = SCINSTRUMENT
 SPACECRAFT_ID                            = 'MGN'
 INSTRUMENT_ID                            = 'RDRS'

 OBJECT                                   = INSTINFO
  INSTRUMENT_NAME                         = 'RADAR SYSTEM'
  INSTRUMENT_TYPE                         = 'RADAR'
  PI_PDS_USER_ID                          = 'GPETTENGILL'
  NAIF_DATA_SET_ID                        = 'UNK'
  BUILD_DATE                              = '1989-01-01'
  INSTRUMENT_MASS                         = 126.1
  INSTRUMENT_HEIGHT                       = 0.304
  INSTRUMENT_LENGTH                       = 1.35
  INSTRUMENT_WIDTH                        = 0.902
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INSTRUMENT_MANUFACTURER_NAME       = "Hughes Aircraft Company"
INSTRUMENT_SERIAL_NUMBER           = 'N/A'
INSTRUMENT_DESC                    = "Radar system includes a 3.7 m
                                     diameter high gain antenna (HGA) for
                                     SAR and radiometry and smaller fan-
                                     beam antenna (ALTA) for altimetry. The
                                     system operates at 12.6 cm wavelength
                                     and shares common electronics. Between
                                     SAR bursts, typically several times a
                                     second, groups of altimeter pulses are
                                     transmitted from a dedicated fan-beam
                                     altimeter antenna directed toward the
                                     spacecraft's nadir. The altimeter pulses
                                     are identical in waveform and
                                     bandwidth to the SAR pulses, resulting in
                                     a range accuracy of better than 15 m. The
                                     pulse-repetition rate and burst duration
                                     differ between the two modes.
                                     Radiometry data are obtained by
                                     spending a portion of the time between
                                     SAR bursts in a passive mode, with the
                                     HGA antenna recording the power
                                     emitted from the planet."
SCIENTIFIC_OBJECTIVES_SUMMARY      = "See MISSION_OBJECTIVES_ SUM-
                                     MARY under MISSION."
INSTRUMENT_CALIBRATION_DESC        = "Calibrated before flight using active
                                     electronic target simulator."
OPERATIONAL_CONSID_DESC            = "The Magellan radar system is used to
                                     acquire altimetry, radiometry, and radar
                                     backscatter (SAR) images when the
                                     spacecraft is close to the planet. Near
                                     apoapsis the SAR antenna is pointed
                                     toward Earth and used to telemeter data
                                     to the DSN."
END_OBJECT                         = INSTINFO

OBJECT                             = INSTDETECT
DETECTOR_ID                        = 'N/A'
DETECTOR_TYPE                      = 'N/A'
DETECTOR_ASPECT_RATIO              = 'N/A'
MINIMUM_WAVELENGTH                 = 'N/A'
MAXIMUM_WAVELENGTH                 = 'N/A'
NOMINAL_OPERATING_TEMPERATURE      = 'N/A'
DETECTOR_DESC                      = "Not applicable"
SENSITIVITY_DESC                   = "Not applicable"
END_OBJECT                         = INSTDETECT

OBJECT                             = INSTELEC
ELECTRONICS_ID                     = 'RDRS'
ELECTRONICS_DESC                   = "The Magellan radar system consists of
                                     a high gain antenna, a smaller fan beam
                                     antenna, and shared electronics.
                                     Electronics package includes modules to
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                                        command and control acquisition of
                                        altimetry, radiometry and SAR
                                        backscatter data."
  END_OBJECT                            = INSTELEC

  OBJECT                                = INSTFILTER
   FILTER_NUMBER                        = 'N/A'
   FILTER_NAME                          = 'N/A'
   FILTER_TYPE                          = 'N/A'
   MINIMUM_WAVELENGTH                   = 'N/A'
   CENTER_FILTER_WAVELENGTH             = 'N/A'
   MAXIMUM_WAVELENGTH                   = 'N/A'
   MEASUREMENT_WAVE_CALBRT_DESC         = "Not applicable"
  END_OBJECT                            = INSTFILTER

  OBJECT                                = INSTOPTICS
   TELESCOPE_ID                         = 'N/A'
   TELESCOPE_FOCAL_LENGTH               = 'N/A'
   TELESCOPE_DIAMETER                   = 'N/A'
   TELESCOPE_F_NUMBER                   = 'N/A'
   TELESCOPE_RESOLUTION                 = 'N/A'
   TELESCOPE_TRANSMITTANCE              = 'N/A'
   TELESCOPE_T_NUMBER                   = 'N/A'
   TELESCOPE_T_NUMBER_ERROR             = 'N/A'
   TELESCOPE_SERIAL_NUMBER              = 'N/A'
   OPTICS_DESC                          = "Not applicable"
  END_OBJECT                            = INSTOPTICS

  OBJECT                                = SCINSTOFFSET
   PLATFORM_OR_MOUNTING_NAME            = 'SPACECRAFT'
   CONE_OFFSET_ANGLE                    = 0
   CROSS_CONE_OFFSET_ANGLE              = 0
   TWIST_OFFSET_ANGLE                   = 0
   INSTRUMENT_MOUNTING_DESC             = "Antennas are mounted to the
                                        spacecraft body."
  END_OBJECT                            = SCINSTOFFSET

  OBJECT                                = INSTSECTION
   SECTION_ID                           = 'RAD'

  OBJECT                                = INSTSECTINFO
 SCAN_MODE_ID                           = '750 kbps'
 DATA_RATE                              = 750000
 SAMPLE_BITS                            = 'N/A'
 TOTAL_FOVS                             = 'N/A'

 OBJECT                                 = INSTSECTFOVS
  FOV_SHAPE_NAME                        = 'N/A'
  HORIZONTAL_PIXEL_FOV                  = 'N/A'
  VERTICAL_PIXEL_FOV                    = 'N/A'
  HORIZONTAL_FOV                        = 'N/A'
  VERTICAL_FOV                          = 'N/A'
  FOVS                                  = 'N/A'
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END_OBJECT                          = INSTSECTFOVS

 END_OBJECT                         = INSTSECTINFO

 OBJECT                             = INSTSECTPARM
  INSTRUMENT_PARAMETER_NAME         = 'RADIANT POWER'
  MINIMUM_INSTRUMENT_PARAMETER      = 'N/A'
  MAXIMUM_INSTRUMENT_PARAMETER      = 'N/A'
  NOISE_LEVEL                       = 'UNK'
  INSTRUMENT_PARAMETER_UNIT         = 'WATTS'
  SAMPLING_PARAMETER_NAME           = 'TIME'
  MINIMUM_SAMPLING_PARAMETER        = 'N/A'
  MAXIMUM_SAMPLING_PARAMETER        = 'N/A'
  SAMPLING_PARAMETER_INTERVAL       = 'N/A'
  SAMPLING_PARAMETER_RESOLUTION     = 'N/A'
  SAMPLING_PARAMETER_UNIT           = 'SECOND'
 END_OBJECT                         = INSTSECTPARM

 OBJECT                             = INSTSECTDET
  DETECTOR_ID                       = 'N/A'
 END_OBJECT                         = INSTSECTDET

 OBJECT                             = INSTSECTELEC
  ELECTRONICS_ID                    = 'RDRS'
 END_OBJECT                         = INSTSECTELEC

 OBJECT                             = INSTSECTFILT
  FILTER_NUMBER                     = 'N/A'
 END_OBJECT                         = INSTSECTFILT

 OBJECT                             = INSTSECTOPTC
  TELESCOPE_ID                      = 'N/A'
 END_OBJECT                         = INSTSECTOPTC

END_OBJECT                          = INSTSECTION

OBJECT                              = INSTSECTION
 SECTION_ID                         = 'SAR'
 OBJECT                             = INSTSECTINFO
  SCAN_MODE_ID                      = '750 kbps'
  DATA_RATE                         = 750000
  SAMPLE_BITS                       = 'N/A'
  TOTAL_FOVS                        = 'N/A'

OBJECT                              = INSTSECTFOVS
 FOV_SHAPE_NAME                     = 'N/A'
 HORIZONTAL_PIXEL_FOV               = 'N/A'
 VERTICAL_PIXEL_FOV                 = 'N/A'
 HORIZONTAL_FOV                     = 'N/A'
 VERTICAL_FOV                       = 'N/A'
 FOVS                               = 'N/A'
END_OBJECT                          = INSTSECTFOVS
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END_OBJECT                                  = INSTSECTINFO

OBJECT                                      = INSTSECTPARM
 INSTRUMENT_PARAMETER_NAME                  = 'RADAR ECHO POWER'
 MINIMUM_INSTRUMENT_PARAMETER               = 'N/A'
 MAXIMUM_INSTRUMENT_PARAMETER               = 'N/A'
 NOISE_LEVEL                                = 'UNK'
 INSTRUMENT_PARAMETER_UNIT                  = 'WATTS'
 SAMPLING_PARAMETER_NAME                    = 'TIME'
 MINIMUM_SAMPLING_PARAMETER                 = 'N/A'
 MAXIMUM_SAMPLING_PARAMETER                 = 'N/A'
 SAMPLING_PARAMETER_INTERVAL                = 'N/A'
 SAMPLING_PARAMETER_RESOLUTION              = 'N/A'
 SAMPLING_PARAMETER_UNIT                    = 'SECOND'
END_OBJECT                                  = INSTSECTPARM

OBJECT                                      = INSTSECTDET
 DETECTOR_ID                                = 'N/A'
END_OBJECT                                  = INSTSECTDET

OBJECT                                      = INSTSECTELEC
 ELECTRONICS_ID                             = 'RDRS'
END_OBJECT                                  = INSTSECTELEC

OBJECT                                      = INSTSECTFILT
 FILTER_NUMBER                              = 'N/A'
END_OBJECT                                  = INSTSECTFILT

OBJECT                                      = INSTSECTOPTC
 TELESCOPE_ID                               = 'N/A'
END_OBJECT                                  = INSTSECTOPTC

END_OBJECT                                  = INSTSECTION

OBJECT                                      = INSTSECTION
 SECTION_ID                                 = 'ALT'

 OBJECT                                     = INSTSECTINFO
  SCAN_MODE_ID                              = '35 kbps'
  DATA_RATE                                 = 35000
  SAMPLE_BITS                               = 'N/A'
  TOTAL_FOVS                                = 'N/A'

OBJECT                                      = INSTSECTFOVS
FOV_SHAPE_NAME                              = 'N/A'
HORIZONTAL_PIXEL_FOV                        = 'N/A'
VERTICAL_PIXEL_FOV                          = 'N/A'
HORIZONTAL_FOV                              = 'N/A'
VERTICAL_FOV                                = 'N/A'
FOVS                                        = 'N/A'
 END_OBJECT                                 = INSTSECTFOVS

 END_OBJECT                                 = INSTSECTINFO
```

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 OBJECT                              = INSTSECTPARM
  INSTRUMENT_PARAMETER_NAME          = 'RADAR ECHO POWER'
  MINIMUM_INSTRUMENT_PARAMETER       = 'N/A'
  MAXIMUM_INSTRUMENT_PARAMETER       = 'N/A'
  NOISE_LEVEL                        = 'UNK'
  INSTRUMENT_PARAMETER_UNIT          = 'WATTS'
  SAMPLING_PARAMETER_NAME            = 'TIME'
  MINIMUM_SAMPLING_PARAMETER         = 'N/A'
  MAXIMUM_SAMPLING_PARAMETER         = 'N/A'
  SAMPLING_PARAMETER_INTERVAL        = 'N/A'
  SAMPLING_PARAMETER_RESOLUTION      = 'N/A'
  SAMPLING_PARAMETER_UNIT            = 'SECOND'
 END_OBJECT                          = INSTSECTPARM

 OBJECT                              = INSTSECTDET
  DETECTOR_ID                        = 'N/A'
 END_OBJECT                          = INSTSECTDET

 OBJECT                              = INSTSECTELEC
  ELECTRONICS_ID                     = 'RDRS'
 END_OBJECT                          = INSTSECTELEC

 OBJECT                              = INSTSECTFILT
  FILTER_NUMBER                      = 'N/A'
 END_OBJECT                          = INSTSECTFILT

 OBJECT                              = INSTSECTOPTC
  TELESCOPE_ID                       = 'N/A'
 END_OBJECT                          = INSTSECTOPTC

END_OBJECT                           = INSTSECTION

OBJECT                               = INSTMODEINFO
 INSTRUMENT_MODE_ID                  = 'RADIOMETRY'
 GAIN_MODE_ID                        = 'N/A'
 DATA_PATH_TYPE                      = 'RECORDED DATA PLAYBACK'
 INSTRUMENT_POWER_CONSUMPTION        = 'UNK'
 INSTRUMENT_MODE_DESC                = "Radiometry data are obtained by the
                                     high gain antenna (HGA) in a receive-
                                     only mode that is activated after the
                                     altimetry mode to record the level of
                                     radiothermal power emitted by the
                                     surface of the planet. Noise power
                                     within the 10-MHz receiver bandwidth
                                     is detected and accumulated for 50 ms. To
                                     reduce the sensitivity to receiver gain
                                     changes in this mode, the receiver is
                                     connected on alternate bursts first to a
                                     comparison dummy load at a known
                                     physical temperature and then to the
                                     HGA. The short-term temperature
                                     resolution is about 2 K; the long-term
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                                        absolute accuracy after calibration
                                        should be about 20 K."

  OBJECT                                = INSTMODESECT
   SECTION_ID                           = 'RAD'
  END_OBJECT                            = INSTMODESECT

 END_OBJECT                             = INSTMODEINFO

 OBJECT                                 = INSTMODEINFO
  INSTRUMENT_MODE_ID                    = 'SAR'
  GAIN_MODE_ID                          = 'N/A'
  DATA_PATH_TYPE                        = 'RECORDED DATA PLAYBACK'
  INSTRUMENT_POWER_CONSUMPTION          = 'UNK'
  INSTRUMENT_MODE_DESC                  = "This mode utilizes the Synthetic
                                        Aperture Radar (SAR) feature of the
                                        radar instrumentation.  Multiple looks
                                        are acquired to reduce speckle.  Signal to
                                        Noise ratio is required to exceed 8 dB.
                                        Incidence Angle varies from 13 degrees at
                                        the pole to about 44 degrees at periapsis."

  OBJECT                                = INSTMODESECT
 SECTION_ID                             = 'SAR'
  END_OBJECT                            = INSTMODESECT

 END_OBJECT                             = INSTMODEINFO

 OBJECT                                 = INSTMODEINFO
  INSTRUMENT_MODE_ID                    = 'ALTIMETRY'
  GAIN_MODE_ID                          = 'N/A'
  DATA_PATH_TYPE                        = 'RECORDED DATA PLAYBACK'
  INSTRUMENT_POWER_CONSUMPTION          = 'UNK'
  INSTRUMENT_MODE_DESC                  = "After SAR bursts, typically several
                                        times a second, groups of altimeter pulses
                                        are transmitted from a dedicated fan
                                        beam altimeter antenna (ALTA) directed
                                        toward the spacecraft's nadir.The
                                        altimetric echoes are processed to yield
                                        altimetric and surface scattering
                                        information covering at least 70% of the
                                        planet."
  OBJECT                                = INSTMODESECT
 SECTION_ID                             = 'ALT'
  END_OBJECT                            = INSTMODESECT

 END_OBJECT                             = INSTMODEINFO

 OBJECT                                 = INSTREFINFO
  REFERENCE_KEY_ID                      = 'SAUNDERSETAL1990'
 END_OBJECT                             = INSTREFINFO
END_OBJECT                              = SCINSTRUMENT
```

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OBJECT_NAME                              = PERSON
  PDS_USER_ID                            = GPETTENGILL

 OBJECT_NAME                             = PERSINFO
  FTS_NUMBER                             = 'N/A'
  FULL_NAME                              = "DR. GORDEN H. PETTENGILL"
  LAST_NAME                              = PETTENGILL
  TELEPHONE_NUMBER                       = "617-253-4281"
  REGISTRATION_DATE                      = '1991-02-27'
  MAILING_ADDRESS_LINE                   = "MASSACHUSETTS INSTITUTE OF
                                         TECHNOLOGY
                                         \n CENTER FOR SPACE RESEARCH
                                         \n BLDG 37 ROOM 641
                                         \n CAMBRIDGE, MA  02139"
 END_OBJECT                              = PERSINFO

 OBJECT_NAME                             = PERSORDER
  BILLING_ADDRESS_LINE                   = "MASSACHUSETTS INSTITUTE OF
                                         TECHNOLOGY
                                         \n CENTER FOR SPACE RESEARCH
                                         \n BLDG 37 ROOM 641 \n CAMBRIDGE,
                                         MA  02139"
  PERSONNEL_SHIPPING_CARRIER_NAM         = 'N/A'
  PERSONNEL_SHIPPING_ACCOUNT_NUM         = 'N/A'
  ORDER_PREFERENCE_ID                    = 'N/A'
 END_OBJECT                              = PERSORDER

 OBJECT_NAME                             = PERSELECMAIL
  ELECTRONIC_MAIL_ID                     = GPETTENGILL
  ELECTRONIC_MAIL_TYPE                   = 'NASAMAIL'
  PREFERENCE_ID                          = 1
 END_OBJECT                              = PERSELECMAIL

 OBJECT_NAME                             = PERSINSTN
  PERSON_INSTITUTION_NAME                = "MASSACHUSETTS INSTITUTE OF
                                         TECHNOLOGY"
 END_OBJECT                              = PERSINSTN

 OBJECT_NAME                             = PERSNODE
  NODE_ID                                = 'GEOSCIENCE'
 END_OBJECT                              = PERSNODE

 OBJECT_NAME                             = PERSMSN
  MISSION_NAME                           = 'MAGELLAN'
  SPACECRAFT_ID                          = 'MGN'
  INSTRUMENT_ID                          = 'RDRS'
  EXPERTISE_AREA_TYPE                    = 'SCIENCE'
  SPECIALTY_DESC                         = "PRINCIPAL INVESTIGATOR"
  ROLE_DESC                              = "SYNTHETIC APERATURE RADAR"
 END_OBJECT                              = PERSMSN

 OBJECT_NAME                             = PERSTASK
  TASK_NAME                              = 'N/A'
```

```
    EXPERTISE_AREA_TYPE                    = 'N/A'
    SPECIALTY_DESC                         = 'N/A'
    ROLE_DESC                              = 'N/A'
   END_OBJECT                              = PERSTASK
  END_OBJECT                               = PERSON

  END
```

C.2 <u>C1MIDRDS.LBL</u>

```
OBJECT                                     = DATASET
 DATA_SET_ID                               = 'MGN-V-RDRS-5-MIDR-C1-V1.0'

OBJECT                                     = DATASETINFO
 DATA_SET_NAME                             = 'MGN V RADAR SYSTEM DERIVED
                                           MIDR COMPRESSED ONCE V1.0'
 DATA_SET_COLLECTION_MEMBER_FLG            = 'N'
 EVENT_START_TIME                          = 'UNK'
 EVENT_STOP_TIME                           = 'UNK'
 NATIVE_START_TIME                         = 'N/A'
 NATIVE_STOP_TIME                          = 'N/A'
 DATA_OBJECT_TYPE                          = 'IMAGE'
 DATA_SET_RELEASE_DATE                     = 'UNK'
 PROCESSING_LEVEL_ID                       =5
 PRODUCER_FULL_NAME                        = 'N/A'
 PRODUCER_INSTITUTION_NAME                 = "Multimission Image Processing
                                           Subsystem, Jet Propulsion Lab"
 SOFTWARE_FLAG                             = 'N'
 DETAILED_CATALOG_FLAG                     = 'N'
 PROCESSING_START_TIME                     = 'UNK'
 PROCESSING_STOP_TIME                      = 'UNK'
 DATA_SET_DESC                             = "Compressed Once Mosaic Image Data
                                           Records (C1-MIDRs) consist of mosaics
                                           generated from compressed basic image
                                           data records (C-BIDRs). C-BIDRs have
                                           been generated by computing 3x3 pixel
                                           arithmetic moving averages from the F-
                                           BIDRs. Each C1-MIDR is in a sinusoidal
                                           equal area projection and has an origin at
                                           0 degrees latitude, with the central
                                           meridian defined as the longitude
                                           bisecting the mosaic. Each C1-MIDR has
                                           7K lines (aligned with latitudes) and 8K
                                           samples, arranged as 56 1K x 1K files.
                                           C1-MIDRs, with their 225m pixel widths
                                           are designed to cover the planet at
                                           reasonably high resolution and high
                                           signal to noise.

                                           The 1K x 1K files have a VICAR2
                                           format, with embedded VICAR2 labels.
                                           The data have been placed on CD-ROMs
```

```
                                        with documentation, detached Planetary
                                        Data System labels, and summary
                                        tabular information.

                                        Over the course of the first mapping
                                        cycle, 184 C1-MIDRs will be generated,
                                        for a total volume of 10.3 Gbytes.

                                        Note: C1-MIDRs can also exist as
                                        photoproducts that have had a linear
                                        contrast enhancement applied.
                                        Photoproducts are generated from 7K x 8K
                                        assemblage of files, so there is one
                                        photoproduct per C1-MIDR.

                                        Finally, in some cases a cross track seam
                                        removal process has been applied. See
                                        the CONTENTS.TAB file on the relevant
                                        MIDR CD-ROM volume for information
                                        on which MIDRs have been seam-
                                        corrected.

                                        Please refer to the F-BIDR (MGN-V-
                                        RDRS-5-BIDR-FULL-RES-V1.0) data set
                                        description for more details on
                                        radiometric and geometric processing of
                                        Magellan SAR data."
  CONFIDENCE_LEVEL_NOTE                 = "Unknown"
 END_OBJECT                             = DATASETINFO

 OBJECT                                 = DATASETTARG
  TARGET_NAME                           = 'VENUS'
 END_OBJECT                             = DATASETTARG

 OBJECT                                 = DSPARMINFO
  SAMPLING_PARAMETER_NAME               = 'PIXEL'
  SAMPLING_PARAMETER_RESOLUTION         = 0.650
  MINIMUM_SAMPLING_PARAMETER            = 'N/A'
  MAXIMUM_SAMPLING_PARAMETER            = 'N/A'
  SAMPLING_PARAMETER_INTERVAL           = 0.225
  MINIMUM_AVAILABLE_SAMPLING_INT        = 'N/A'
  SAMPLING_PARAMETER_UNIT               = 'KILOMETER'
  DATA_SET_PARAMETER_NAME               = 'RADAR SCALED BACKSCATTER
                                        CROSS SECTION'
  NOISE_LEVEL                           = 'UNK'
  DATA_SET_PARAMETER_UNIT               = 'DIMENSIONLESS'
 END_OBJECT                             = DSPARMINFO

 OBJECT                                 = SCDATASET
  INSTRUMENT_HOST_ID                    = 'MGN'
  INSTRUMENT_ID                         = 'RDRS'
 END_OBJECT                             = SCDATASET
```

```
        OBJECT                              = DSREFINFO
         REFERENCE_KEY_ID                   = 'SAUNDERSETAL1990'
        END_OBJECT                          = DSREFINFO

        OBJECT                              = DSREFINFO
         REFERENCE_KEY_ID                   = 'ANDERSEN1988'

        OBJECT                              = REFERENCE
         DOCUMENT_TOPIC_TYPE                = 'SOFTWARE INTERFACE
                                            SPECIFICATION'
         JOURNAL_NAME                       = 'N/A'
         PUBLICATION_DATE                   = '1988'
         REFERENCE_DESC                     = "Andersen, Kurt, Mosaicked Image
                                            Data Record, Project Magellan Software
                                            Interface Specification Document IDPS-
                                            104, Jet Propulsion Laboratory, Pasadena,
                                            Calif., 1988."

       OBJECT                               = REFAUTHORS
        AUTHOR_FULL_NAME                    = 'Kurt Andersen'
       END_OBJECT                           = REFAUTHORS

        END_OBJECT                          = REFERENCE

       END_OBJECT                           = DSREFINFO

       OBJECT                               = DSREFINFO
        REFERENCE_KEY_ID                    = 'MGNFRD1989'

       OBJECT                               = REFERENCE
        DOCUMENT_TOPIC_TYPE                 = 'FUNCTIONAL REQUIREMENTS
                                            DOCUMENT'
        JOURNAL_NAME                        = 'N/A'
        PUBLICATION_DATE                    = '1989'
        REFERENCE_DESC                      = "Magellan Mission: Image Data
                                            Processing Subsystem Functional
                                            Requirements, MOS-4-272, Jet Propulsion
                                            Laboratory, Pasadena, Calif., 1989."

       OBJECT                               = REFAUTHORS
       AUTHOR_FULL_NAME                     = 'N/A'
        END_OBJECT                          = REFAUTHORS

       END_OBJECT                           = REFERENCE
      END_OBJECT                            = DSREFINFO

     END_OBJECT                             = DATASET

     END
```

C.3 <u>C2MIDRDS.LBL</u>

```
     OBJECT                                 = DATASET
```

| | |
|---|---|
| DATA_SET_ID | = 'MGN-V-RDRS-5-MIDR-C2-V1.0' |
| OBJECT | = DATASETINFO |
| DATA_SET_NAME | = 'MGN V RADAR SYSTEM DERIVED MIDR COMPRESSED TWICE V1.0' |
| DATA_SET_COLLECTION_MEMBER_FLG | = 'N' |
| EVENT_START_TIME | = 'UNK' |
| EVENT_STOP_TIME | = 'UNK' |
| NATIVE_START_TIME | = 'N/A' |
| NATIVE_STOP_TIME | = 'N/A' |
| DATA_OBJECT_TYPE | = 'IMAGE' |
| DATA_SET_RELEASE_DATE | = 'UNK' |
| PROCESSING_LEVEL_ID | =5 |
| PRODUCER_FULL_NAME | = 'N/A' |
| PRODUCER_INSTITUTION_NAME | = "Multimission Image Processing Subsystem, Jet Propulsion Lab" |
| SOFTWARE_FLAG | = 'N' |
| DETAILED_CATALOG_FLAG | = 'N' |
| PROCESSING_START_TIME | = 'UNK' |
| PROCESSING_STOP_TIME | = 'UNK' |
| DATA_SET_DESC | = "Compressed Twice Mosaicked Image Data Records (C2-MIDRs) consist of mosaics generated by computing 3x3 pixel arithmetic moving averages from the C1-MIDRs. Each C2-MIDR is in a sinusoidal equal area projection and has an origin at 0 degrees latitude, with the central meridian defined as the longitude bisecting the mosaic. Each C2-MIDR has 7168 lines (aligned with latitudes) and 8192 samples, arranged as 56 1024x1024 files. C2-MIDRs, with their 675 m pixel widths, are designed to cover the planet at reasonably high resolution and high signal to noise.<br><br>The 1024x1024 files have a VICAR2 format, with embedded VICAR2 labels. The data have been placed on CD-ROMs with documentation, detached Planetary Data System labels, and summary tabular information.<br><br>One C2-MIDR frame covers 45 degrees of latitude and longitude. Twenty-six C2-MIDRs will be generated during the first mapping cycle. |

Note: C2-MIDRs can also exist as photoproducts that have had a linear contrast enhancement applied. Photoproducts are generated from the 7K x 8K assemblage of files, so there is one photoproduct per C2-MIDR.

Finally, in some cases a cross track seam removal process has been applied. See the CONTENTS.TAB file on the relevant MIDR CD-ROM volume for information on which MIDRs have been seam-corrected.

Please refer to the F-BIDR (MGN-V-RDRS-5-BIDR-FULL-RES-V1.0) data set description for more details on radiometric and geometric processing of Magellan SAR data."

```
CONFIDENCE_LEVEL_NOTE               = "Unknown"

END_OBJECT                          = DATASETINFO

OBJECT                              = DATASETTARG
TARGET_NAME                         = 'VENUS'
END_OBJECT                          = DATASETTARG

OBJECT                              = DSPARMINFO
SAMPLING_PARAMETER_NAME             = 'PIXEL'
SAMPLING_PARAMETER_RESOLUTION       = 1.350
MINIMUM_SAMPLING_PARAMETER          = 'N/A'
MAXIMUM_SAMPLING_PARAMETER          = 'N/A'
SAMPLING_PARAMETER_INTERVAL         = 0.675
MINIMUM_AVAILABLE_SAMPLING_INT      = 'N/A'
SAMPLING_PARAMETER_UNIT             = 'KILOMETER'
DATA_SET_PARAMETER_NAME             = 'RADAR SCALED BACKSCATTER
                                      CROSS SECTION'
NOISE_LEVEL                         = 'UNK'
DATA_SET_PARAMETER_UNIT             = 'DIMENSIONLESS'
END_OBJECT                          = DSPARMINFO

OBJECT                              = SCDATASET
INSTRUMENT_HOST_ID                  = 'MGN'
INSTRUMENT_ID                       = 'RDRS'
END_OBJECT                          = SCDATASET

OBJECT                              = DSREFINFO
REFERENCE_KEY_ID                    = 'SAUNDERSETAL1990'
END_OBJECT                          = DSREFINFO

OBJECT                              = DSREFINFO
REFERENCE_KEY_ID                    = 'ANDERSEN1988'
END_OBJECT                          = DSREFINFO
```

| | |
|---|---|
| OBJECT | = DSREFINFO |
| REFERENCE_KEY_ID | = 'MGNFRD1989' |
| END_OBJECT | = DSREFINFO |
| END_OBJECT | = DATASET |
| END | |

## C.4 C3MIDRDS.LBL

| | |
|---|---|
| OBJECT | = DATASET |
| DATA_SET_ID | = 'MGN-V-RDRS-5-MIDR-C3-V1.0' |
| OBJECT | = DATASETINFO |
| DATA_SET_NAME | = 'MGN V RADAR SYSTEM DERIVED MIDR COMPRESSED THRICE V1.0' |
| DATA_SET_COLLECTION_MEMBER_FLG | = 'N' |
| EVENT_START_TIME | = 'UNK' |
| EVENT_STOP_TIME | = 'UNK' |
| NATIVE_START_TIME | = 'N/A' |
| NATIVE_STOP_TIME | = 'N/A' |
| DATA_OBJECT_TYPE | = 'IMAGE' |
| DATA_SET_RELEASE_DATE | = 'UNK' |
| PROCESSING_LEVEL_ID | = 5 |
| PRODUCER_FULL_NAME | = 'N/A' |
| PRODUCER_INSTITUTION_NAME | = "Multimission Image Processing Subsystem, Jet Propulsion Lab" |
| SOFTWARE_FLAG | = 'N' |
| DETAILED_CATALOG_FLAG | = 'N' |
| PROCESSING_START_TIME | = 'UNK' |
| PROCESSING_STOP_TIME | = 'UNK' |
| DATA_SET_DESC | = "Compressed Thrice Mosaicked Image Data Records (C3-MIDRs) consist of mosaics generated by computing 3x3 pixel arithmetic moving averages from the C2-MIDRs. Each C3-MIDR is in a sinusoidal equal area projection and has an origin at 0 degrees latitude, with the central meridian defined as the longitude bisecting the mosaic. Each C1-MIDR has 7168 lines (aligned with latitudes) and 8192 samples, arranged as 56 1024 x 1024 files. C3-MIDRs, with their 2.025 km pixel widths, are designed to cover the planet at reasonably high resolution and high signal to noise. |

The 1024 x 1024 files have a VICAR2 format, with embedded VICAR2 labels. The data have been placed on CD-ROMs with documentation, detached Planetary Data System labels, and summary tabular information.

One C3-MIDR frame covers 80 degrees in latitude and 120 degrees in longitude. Six C3-MIDRs will be generated during the first mapping cycle.

Note: C3-MIDRs can also exist as photoproducts that have had a linear contrast enhancement applied. Photoproducts are generated from the 7K x 8K assemblage of files, so there is one photoproduct per C3-MIDR.

Finally, in some cases a cross track seam removal process has been applied. See the CONTENTS.TAB file on the relevant MIDR CD-ROM volume for information on which MIDRs have been seam-corrected.

Please refer to the F-BIDR (MGN-V-RDRS-5-BIDR-FULL-RES-V1.0) data set description for more details on radiometric and geometric processing of Magellan SAR data."

```
CONFIDENCE_LEVEL_NOTE                  = "Unknown"

END_OBJECT                             = DATASETINFO

OBJECT                                 = DATASETTARG
TARGET_NAME                            = 'VENUS'
END_OBJECT                             = DATASETTARG

OBJECT                                 = DSPARMINFO

SAMPLING_PARAMETER_NAME                = 'PIXEL'
SAMPLING_PARAMETER_RESOLUTION          = 4.05
MINIMUM_SAMPLING_PARAMETER             = 'N/A'
MAXIMUM_SAMPLING_PARAMETER             = 'N/A'
SAMPLING_PARAMETER_INTERVAL            = 2.025
MINIMUM_AVAILABLE_SAMPLING_INT         = 'N/A'
SAMPLING_PARAMETER_UNIT                = 'KILOMETER'
DATA_SET_PARAMETER_NAME                = 'RADAR SCALED BACKSCATTER
                                         CROSS SECTION'
NOISE_LEVEL                            = 'UNK'
DATA_SET_PARAMETER_UNIT                = 'DIMENSIONLESS'
```

```
END_OBJECT                          = DSPARMINFO

OBJECT                              = SCDATASET
INSTRUMENT_HOST_ID                  = 'MGN'
INSTRUMENT_ID                       = 'RDRS'
END_OBJECT                          = SCDATASET

OBJECT                              = DSREFINFO
REFERENCE_KEY_ID                    = 'SAUNDERSETAL1990'
END_OBJECT                          = DSREFINFO

OBJECT                              = DSREFINFO
REFERENCE_KEY_ID                    = 'ANDERSEN1988'
END_OBJECT                          = DSREFINFO

OBJECT                              = DSREFINFO
REFERENCE_KEY_ID                    = 'MGNFRD1989'
END_OBJECT                          = DSREFINFO

END_OBJECT                          = DATASET

END
```

C.5 FBIDRDS.LBL

```
OBJECT                              = DATASET

DATA_SET_ID                         = 'MGN-V-RDRS-5-BIDR-FULL-RES-
                                      V1.0'

OBJECT                              = DATASETINFO

DATA_SET_NAME                       = 'MGN V RDRS DERIVED BASIC
                                      IMAGE DATA RECORD FULL RES V1.0'
DATA_SET_COLLECTION_MEMBER_FLG      = 'N'
EVENT_START_TIME                    = 'UNK'
EVENT_STOP_TIME                     = 'UNK'
NATIVE_START_TIME                   = 'N/A'
NATIVE_STOP_TIME                    = 'N/A'
DATA_OBJECT_TYPE                    = 'IMAGE'
DATA_SET_RELEASE_DATE               = 'UNK'
PROCESSING_LEVEL_ID                 = 5
PRODUCER_FULL_NAME                  = 'N/A'
PRODUCER_INSTITUTION_NAME           = "Multimission SAR Processing Facility,
                                      Jet Propulsion Lab"
SOFTWARE_FLAG                       = 'N'
DETAILED_CATALOG_FLAG               = 'N'
PROCESSING_START_TIME               = 'UNK'
PROCESSING_STOP_TIME                = 'UNK'
DATA_SET_DESC                       = "Full resolution basic image data
          records (F-BIDR) consist of SAR image data acquired along one orbit.  Pixel
          widths are 75m.  Data are presented as 8 bit pixel brightness values where the
```

brightness is in proportion to the radar scaled backscatter cross section. Scaling is accomplished by dividing the cross section value for each pixel by the value estimated from the Muhleman Law for the relevant incidence angle, converting the ratio to decibels, and scaling to a 1 to 251 output range. The 1 value corresponds to -20 dB and 251 to +30 dB, with a linear quantization of 0.2 dB in between. Data have at least 4 looks. Specifically, the scaled radar backscatter cross section is generated by:

1. Dividing the radar backscatter cross section / pixel area by the Muhleman Law.

sigma naught = 0.0118 cos(i) / ((sin(i) + 0.111 cos(i))**3)

where i = incidence angle.

(Note: A value of 0.0188 was intended for the multiplicative constant, but 0.0118 was used by mistake.)

2. Converting to dB by taking 10 times log base 10 of the ratio generated in the first step.

3. Scaling output to a byte DN value using the expression:

DN = 1 + INT ({MIN [MAX(RV,-20), 30] + 20} * 5)

where RV = value produced in step 2, and

INT = nearest integer function.

F-BIDRs are presented as image files containing two integers at the beginning of each line. The first integer specifies the pixel offset to the first valid pixel; the second specifies the pixel offset to the last valid pixel. The remainder of the line consists of scaled backscatter cross section values.

Regions within 89 degrees of the equator have F-BIDRs in sinusoidal equal area projection; F-BIDR data located more than 80 degrees of the equator are also in oblique sinusoidal equal area projections. For the sinusoidal equal area projection, the origin is at 0 degrees latitude and the central meridian is the sub-spacecraft longitude at the equator, adjusted to the nearest multiple of 75m, relative to a pixel centered at 0 degrees longitude. For details of use of the oblique sinusoidal equal area projection see Magellan Software Interface Specification (SIS) Document by John Gilbert, Full Resolution Basic Image Data Record, SDPS-101, October 1990.

First mapping cycle F-BIDRs extend from the north pole to approximately 60 degrees south latitude for northern strips and from just below the north pole to 70 degrees south latitude for intervening F-BIDR strips. Images sizes are approximately 350 samples by 220,000 lines.

Each F-BIDR file is located, together with a number of other, ancillary files, on one 6250 BPI 2400 foot 9 track tape. Each F-BIDR consists of approximately 106 million bytes of image data and 39 million bytes of ancillary data. Included in the ancillary files are processing parameters, orbital information, and radar operational information. Each F-BIDR tape contains 19 separate files."

| | |
|---|---|
| CONFIDENCE_LEVEL_NOTE | = "Unknown" |
| END_OBJECT | = DATASETINFO |
| OBJECT | = DATASETTARG |
| TARGET_NAME | = 'VENUS' |
| END_OBJECT | = DATASETTARG |
| OBJECT | = DSPARMINFO |
| SAMPLING_PARAMETER_NAME | = 'PIXEL' |
| SAMPLING_PARAMETER_RESOLUTION | = 0.150 |
| MINIMUM_SAMPLING_PARAMETER | = 'N/A' |
| MAXIMUM_SAMPLING_PARAMETER | = 'N/A' |
| SAMPLING_PARAMETER_INTERVAL | = 0.075 |
| MINIMUM_AVAILABLE_SAMPLING_INT | = 'N/A' |
| SAMPLING_PARAMETER_UNIT | = 'KILOMETER' |
| DATA_SET_PARAMETER_NAME | = 'RADAR SCALED BACKSCATTER CROSS SECTION' |
| NOISE_LEVEL | = 'UNK' |
| DATA_SET_PARAMETER_UNIT | = 'DIMENSIONLESS' |
| END_OBJECT | = DSPARMINFO |
| OBJECT | = SCDATASET |
| INSTRUMENT_HOST_ID | = 'MGN' |
| INSTRUMENT_ID | = 'RDRS' |
| END_OBJECT | = SCDATASET |
| OBJECT | = DSREFINFO |
| REFERENCE_KEY_ID | = 'SAUNDERSETAL1990' |
| END_OBJECT | = DSREFINFO |
| OBJECT | = DSREFINFO |
| REFERENCE_KEY_ID | = 'GILBERT1990' |
| OBJECT | = REFERENCE |
| DOCUMENT_TOPIC_TYPE | = 'SOFTWARE INTERFACE SPECIFICATION' |
| JOURNAL_NAME | = 'N/A' |
| PUBLICATION_DATE | = '1990' |
| REFERENCE_DESC | = "Gilbert, John, Full Resolution Basic Image Data Record, Project Magellan Software Interface Specification Document SDPS-101, Jet Propulsion Laboratory, Pasadena, Calif., 1990." |

```
OBJECT                              = REFAUTHORS
AUTHOR_FULL_NAME                    = 'JOHN GILBERT'
END_OBJECT                          = REFAUTHORS
END_OBJECT                          = REFERENCE
END_OBJECT                          = DSREFINFO
END_OBJECT                          = DATASET
END
```

C.6 FMIDRDS.LBL

```
OBJECT                              = DATASET
 DATA_SET_ID                        = 'MGN-V-RDRS-5-MIDR-FULL-RES-
                                      V1.0'
 OBJECT                             = DATASETINFO
  DATA_SET_NAME                     = 'MGN V RDRS DERIVED MOSAIC
                                      IMAGE DATA RECORD FULL RES V1.0'
  DATA_SET_COLLECTION_MEMBER_FLG    = 'N'
  EVENT_START_TIME                  = '1990-09-15T00:00:00.000Z'
  EVENT_STOP_TIME                   = '1990-10-05T00:00:00.000Z'
  NATIVE_START_TIME                 = 'N/A'
  NATIVE_STOP_TIME                  = 'N/A'
  DATA_OBJECT_TYPE                  = 'IMAGE'
  DATA_SET_RELEASE_DATE             = '1991-03-27'
  PROCESSING_LEVEL_ID               = 5
  PRODUCER_FULL_NAME                = 'N/A'
  PRODUCER_INSTITUTION_NAME         = "Multimission Image Processing
                                      Subsystem, Jet Propulsion Lab"
  SOFTWARE_FLAG                     = 'N'
  DETAILED_CATALOG_FLAG             = 'N'
  PROCESSING_START_TIME             = '1990-10-29T00:00:00.000Z'
  PROCESSING_STOP_TIME              = '1991-01-08T01:05:09.000Z'
  DATA_SET_DESC                     = "Full-resolution Mosaic Image Data

                                      Records (F-MIDR) consist of SAR mosaics
                                      generated from F-BIDRs (i.e. with 75
                                      meters/pixel).  Each F-MIDR is in a
                                      sinusoidal equal area projection and has
                                      an origin at 0 degrees latitude, with the
                                      central meridian defined as the longitude
                                      bisecting the mosaic.  Each F-MIDR has
                                      7168 lines (aligned with latitude) by 8192
                                      samples, arranged as 56 1024 x 1024 files.
                                      F-MIDRs have been generated for key
                                      terrains on the planet, regions where
                                      highest spatial resolution is required for
                                      analysis.

                                      The 1024 x 1024 files have a VICAR2
                                      format, with an imbedded VICAR2 label.
                                      The data have been placed on CD-ROMs
```

with documentation, detached Planetary Data System labels.

Over the course of the first mapping cycle approximately 220 F-MIDRs will have been generated, covering about 15% of Venus, and constituting about 12.3 Gbytes of data.

F-MIDRs also exist as photoproducts that have had a linear contrast enhancement applied. A single enhancement has been applied to all F-MIDR photoproducts. Photoproducts are generated from the 7K x 8K assemblage of files, so there is one photoproduct per F-MIDR.

Finally, in some cases a cross track seam removal process has been applied. See the CONTENTS.TAB file on the relevant MIDR CD-ROM volume for information on which MIDRs have been seam-corrected.

Please refer to the F-BIDR (MGN-V-RDRS-5-BIDR-FULL-RES-V1.0) data set description for more details on radiometric and geometric processing of Magellan SAR data."

```
 CONFIDENCE_LEVEL_NOTE                  = "Unknown"
END_OBJECT                              = DATASETINFO

OBJECT                                  = DATASETTARG
 TARGET_NAME                            = 'VENUS'
END_OBJECT                              = DATASETTARG

OBJECT                                  = DSPARMINFO
 SAMPLING_PARAMETER_NAME                = 'PIXEL'
 SAMPLING_PARAMETER_RESOLUTION          = 0.150
 MINIMUM_SAMPLING_PARAMETER             = 'N/A'
 MAXIMUM_SAMPLING_PARAMETER             = 'N/A'
 SAMPLING_PARAMETER_INTERVAL            = 0.075
 MINIMUM_AVAILABLE_SAMPLING_INT         = 'N/A'
 SAMPLING_PARAMETER_UNIT                = 'KILOMETER'
 DATA_SET_PARAMETER_NAME                = 'RADAR SCALED BACKSCATTER
                                        CROSS SECTION'
 NOISE_LEVEL                            = 'UNK'
 DATA_SET_PARAMETER_UNIT                = 'DIMENSIONLESS'
END_OBJECT                              = 'DSPARMINFO'

OBJECT                                  = SCDATASET
 INSTRUMENT_HOST_ID                     = 'MGN'
```

```
   INSTRUMENT_ID                          = 'RDRS'
  END_OBJECT                              = SCDATASET

  OBJECT                                  = DSREFINFO
   REFERENCE_KEY_ID                       = 'SAUNDERSETAL1990'
  END_OBJECT                              = DSREFINFO

  OBJECT                                  = DSREFINFO
   REFERENCE_KEY_ID                       = 'ANDERSEN1988'

   OBJECT                                 = REFERENCE
    DOCUMENT_TOPIC_TYPE                   = 'SOFTWARE INTERFACE
                                          SPECIFICATION'
    JOURNAL_NAME                          = 'N/A'
    PUBLICATION_DATE                      = '1988'
    REFERENCE_DESC                        = "Andersen, Kurt, Mosaicked Image
                                          Data Record, Project Magellan Software
                                          Interface Specification Document IDPS-
                                          104, Jet Propulsion Laboratory, Pasadena,
                                          Calif., 1988."

    OBJECT                                = REFAUTHORS
    AUTHOR_FULL_NAME                      = 'Kurt Andersen'
    END_OBJECT                            = REFAUTHORS

   END_OBJECT                             = REFERENCE
  END_OBJECT                              = DSREFINFO

 END_OBJECT                               = DATASET
 END
```

C.7 <u>xPMIDRDS.LBL</u>

In the following label, x is N or S.

<u>NPMIDRDS.LBL</u>

```
OBJECT                                    = DATASET
 DATA_SET_ID                              = 'MGN-V-RDRS-5-MIDR-N-POLAR-
                                          STEREOGR-V1.0'
 OBJECT                                   = DATASETINFO
  DATA_SET_NAME                           = 'MGN V RDRS 5 DERIVED MIDR
                                          NORTH POLAR STEREOGRAPHIC
                                          V1.0'
  DATA_SET_COLLECTION_MEMBER_FLG          = 'N'
  EVENT_START_TIME                        = 'UNK'
  EVENT_STOP_TIME                         = 'UNK'
  NATIVE_START_TIME                       = 'N/A'
```

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   NATIVE_STOP_TIME                      = 'N/A'
   DATA_OBJECT_TYPE                      = 'IMAGE'
   DATA_SET_RELEASE_DATE                 = 'UNK'
   PROCESSING_LEVEL_ID                   = 5
   PRODUCER_FULL_NAME                    = 'N/A'
   PRODUCER_INSTITUTION_NAME             = "Multimission Image Processing
                                         Subsystem, Jet Propulsion Lab"
   SOFTWARE_FLAG                         = 'N'
   DETAILED_CATALOG_FLAG                 = 'N'
   PROCESSING_START_TIME                 = 'UNK'
   PROCESSING_STOP_TIME                  = 'UNK'
   DATA_SET_DESC                         = "The North Polar Mosaic Image Data
                                         Record (P-MIDR-N) is a special product
                                         mosaic to be generated from C-BIDR data
                                         and displayed in a polar stereographic
                                         projection. The P-MIDR-N extends from
                                         the north pole to 80 degrees North
                                         latitude. Pixel widths are
                                         approximately 225 meters."
   CONFIDENCE_LEVEL_NOTE                 = "Unknown"
  END_OBJECT                             = DATASETINFO

  OBJECT                                 = DATASETTARG
   TARGET_NAME                           = 'VENUS'
  END_OBJECT                             = DATASETTARG

  OBJECT                                 = DSPARMINFO
   SAMPLING_PARAMETER_NAME               = 'PIXEL'
   SAMPLING_PARAMETER_RESOLUTION         = 0.450
   MINIMUM_SAMPLING_PARAMETER            = 'N/A'
   MAXIMUM_SAMPLING_PARAMETER            = 'N/A'
   SAMPLING_PARAMETER_INTERVAL           = 0.225
   MINIMUM_AVAILABLE_SAMPLING_INT        = 'N/A'
   SAMPLING_PARAMETER_UNIT               = 'KILOMETER'
   DATA_SET_PARAMETER_NAME               = 'RADAR SCALED BACKSCATTER
                                         CROSS SECTION'
   NOISE_LEVEL                           = 'UNK'
   DATA_SET_PARAMETER_UNIT               = 'DIMENSIONLESS'
  END_OBJECT                             = DSPARMINFO

  OBJECT                                 = SCDATASET
   INSTRUMENT_HOST_ID                    = 'MGN'
   INSTRUMENT_ID                         = 'RDRS'
  END_OBJECT                             = SCDATASET

  OBJECT                                 = DSREFINFO
   REFERENCE_KEY_ID                      = 'SAUNDERSETAL1990'
  END_OBJECT                             = DSREFINFO

 END_OBJECT                              = DATASET

 END
```

SPMIDRDS.LBL

```
OBJECT                              = DATASET
 DATA_SET_ID                        = 'MGN-V-RDRS-5-MIDR-S-POLAR-
                                      STEREOGR-V1.0'
 OBJECT                             = DATASETINFO
  DATA_SET_NAME                     = 'MGN V RDRS 5 DERIVED MIDR
                                      SOUTH POLAR STEREOGRAPHIC V1.0'
  DATA_SET_COLLECTION_MEMBER_FLG    = 'N'
  EVENT_START_TIME                  = 'UNK'
  EVENT_STOP_TIME                   = 'UNK'
  NATIVE_START_TIME                 = 'N/A'
  NATIVE_STOP_TIME                  = 'N/A'
  DATA_OBJECT_TYPE                  = 'IMAGE'
  DATA_SET_RELEASE_DATE             = 'UNK'
  PROCESSING_LEVEL_ID               = 5
  PRODUCER_FULL_NAME                = 'N/A'
  PRODUCER_INSTITUTION_NAME         = "Multimission Image Processing
                                      Subsystem, Jet Propulsion Lab"
  SOFTWARE_FLAG                     = 'N'
  DETAILED_CATALOG_FLAG             = 'N'
  PROCESSING_START_TIME             = 'UNK'
  PROCESSING_STOP_TIME              = 'UNK'
  DATA_SET_DESC                     = "The South Polar Mosaic Image Data
                                      Record (P-MIDR-S) is a special product
                                      mosaic to be generated from C-BIDR data
                                      and displayed in a polar stereographic
                                      projection. The P-MIDR-S extends from
                                      the south pole to 80 degrees South
                                      latitude. Pixel widths are
                                      approximately 225 meters."
  CONFIDENCE_LEVEL_NOTE             = "Unknown"
 END_OBJECT                         = DATASETINFO

 OBJECT                             = DATASETTARG
  TARGET_NAME                       = 'VENUS'
 END_OBJECT                         = DATASETTARG

 OBJECT                             = DSPARMINFO
  SAMPLING_PARAMETER_NAME           = 'PIXEL'
  SAMPLING_PARAMETER_RESOLUTION     = 0.450
  MINIMUM_SAMPLING_PARAMETER        = 'N/A'
  MAXIMUM_SAMPLING_PARAMETER        = 'N/A'
  SAMPLING_PARAMETER_INTERVAL       = 0.225
  MINIMUM_AVAILABLE_SAMPLING_INT    = 'N/A'
  SAMPLING_PARAMETER_UNIT           = 'KILOMETER'
  DATA_SET_PARAMETER_NAME           = 'RADAR SCALED BACKSCATTER
                                      CROSS SECTION'
  NOISE_LEVEL                       = 'UNK'
  DATA_SET_PARAMETER_UNIT           = 'DIMENSIONLESS'
 END_OBJECT                         = DSPARMINFO
```

```
OBJECT                              = SCDATASET
 INSTRUMENT_HOST_ID                 = 'MGN'
 INSTRUMENT_ID                      = 'RDRS'
END_OBJECT                          = SCDATASET

OBJECT                              = DSREFINFO
 REFERENCE_KEY_ID                   = 'SAUNDERSETAL1990'
END_OBJECT                          = DSREFINFO

END_OBJECT                          = DATASET

END
```