```
PDS_VERSION_ID               = PDS3
LABEL_REVISION_NOTE          = "2004-10-1, Initial"
RECORD_TYPE                  = STREAM

OBJECT                       = ASCII_DOCUMENT
  DOCUMENT_NAME              = "
    Cassini Project Visual and Infrared Mapping Spectrometer (VIMS)
    archive volume and detached planetary data system (PDS) label
    software interface specification (SIS)."
  PUBLICATION_DATE           = 2005-04-01
  DOCUMENT_TOPIC_TYPE        = "ARCHIVE DESCRIPTION"
  INTERCHANGE_FORMAT         = ASCII
  DOCUMENT_FORMAT            = TEXT
  DESCRIPTION                = "
    This file is an ASCII text document describing the VIMS
    data archive product."
END_OBJECT                   = ASCII_DOCUMENT

END
```

CASSINI PROJECT

VISUAL AND INFRARED MAPPING SPECTROMETER
(VIMS)

ARCHIVE VOLUME AND DETACHED PLANETARY DATA SYSTEM (PDS) LABEL SOFTWARE INTERFACE SPECIFICATION (SIS)

Version 1.1
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Approved by:

Robert H. Brown, VIMS Team Leader

Virginia Smith, VIMS Archive Specialist

John Ivens, VIMS Systems Programmer

Diane Conner, Cassini Project Archive Coordinator

Sue Lavoie, PDS Imaging Node Manager

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DOCUMENT CHANGE LOG

Change	Date	Affected Portions
Incorporated changes to version 0.5 based on telecom from 1-14-03 with D. Conner, R. McCloskey	1-29-03	Various
Various	3-3-03	Section 1 through 4
Various	4-16-03	Section 1 through 4 2.7 S/W Dir Contents 3.1.4 Software File Format 4.6 Volume_name Appendix B Sample Detached

			Labels	
Conversion from Microsoft Word to Text	9-30-04	All		

ACRONYMS AND ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
CODMAC	Committee On Data Management And Computation
DVD	Digital Versatile Disc
EDR	Experiment Data Record
GIF	Graphics Interchange Format
HTML	HyperText Markup Language
IDL	Interactive Data Language
ISIS	Integrated Software for Imagers and Spectrometers
ISO	International Standards Organization
JPEG	Joint Photographic Experts Group
JPL	Jet Propulsion Laboratory
LPL	Lunar and Planetary Laboratory
MIPS	Multimission Image Processing Subsystem
NASA	National Aeronautics and Space Administration
NSSDC	National Space Science Data Center
PDF	Adobe(r) Portable Document Format
PDS	Planetary Data System
QUB	Qube
SIS	Software Interface Specification
SOI	Saturn Orbit Insertion
TBD	To Be Determined
UA	University of Arizona
USGS	United States Geological Survey
VIMS	Visual and Infrared Mapping Spectrometer

GLOSSARY

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

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

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

Data Product - A labeled grouping of data resulting from a scientific

observation, usually stored in one file. A product label identifies, describes, and defines the structure of the data. An example of a data product is a planetary image, a spectrum table, or a time series table.

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

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

1. Introduction

1.1. Purpose and Scope

The intended use of this Software Interface Specification is by those who wish to understand the format and content of the Cassini Project/Visual and Infrared Mapping Spectrometer (VIMS) Archive. Typically, these individuals would be planetary scientists, software engineers, or data analysts.

The specifications in this document apply to all VIMS standard product archive volumes that are generated by the Cassini/VIMS team.

1.2. Content Overview

The VIMS archive volume set consists of the VIMS data products, PDS required files (AAREADME, INDEX, ERRATA, etc.) and instrument documentation, along with calibration files, calibration algorithms and documentation necessary to produce higher level calibrated products.

The VIMS data products consist of Experiment Data Records (EDRs), which are USGS ISIS compliant 3-Dimensional multispectral cube data (CODMAC Level 2) produced by the VIMS instrument onboard the Cassini spacecraft,
and the detached PDS labels (see Appendix A). Telemetry data are processed into Qube data records by the MIPS team of the Jet Propulsion Laboratory in Pasadena, California. The VIMS science team at the University of Arizona in Tucson is responsible for assemblage and review
of the archive, while the PDS is responsible for validating it.

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

1.3. Applicable Documents and Constraints

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

documents:

1. Cassini Program Data Management Plan (PDMP), JPL D-12560, PD 699-061,
Rev. B, April 1999.

2. Cassini/Huygens Archive Plan for Science Data, JPL
D-15976, 699-068, Version 3, June 2004.

3. Cassini Visual and Infrared Mapping Spectrometer (VIMS) Tour Level 1A
Data File, JPL D-24905, Tour Version 1.0 - DOVI-002, December 20, 2002.

4. Planetary Data System Data Preparation Workbook, February 17, 1995, Version 3.1, JPL D-7669, Part 1.

5. Planetary Data System Standards Reference, October 15, 2002, Version 3.5, JPL D-7669, Part 2.

1.4. Relationships with Other Interfaces

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

2. Archive Volume Contents

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

2.1. Root Directory Contents

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

File Name	File Contents	Provided By
aareadme.txt	Volume content and format information	VIMS Team
errata.txt	A cumulative listing of comments and updates concerning all archive volumes published to date.	VIMS Team
voldesc.cat	A description of the contents of this volume in a PDS format readable by both humans and computers.	VIMS Team

2.2. Data Directory Contents and Naming

The following is a map of the directory structure:

```
            |--- /data         Contains all data in a branching tree
```

```
|        |         structure of subdirectories.  Sub-
|        |         directory names are based on space-
|        |         craft ephemeris time (SCET) and file
|        |         names are based on spacecraft clock
|        |         time values (SCLK).
|        |
|        |-start_end       Data subdirectory containing
|              |           files between the start time
|              |           in the format of YYYYDOYtHHMMSS
|              |           and the end time in the same
|              |           format of YYYYDOYtHHMMSS.
|              |
|              |-vnnnnnnnnnn_V.qub   VIMS data cube(s) for
|              |                     SCLK start time
|              |                     nnnnnnnnnn version V.
|              |
|              |-vnnnnnnnnnn_V.lbl   VIMS data cube labels.
```

By default, any cube with spatial extent, that is any cube that is greater in extent than 1x1, will be unpacked before it is stored in the archive. These cubes will have the same sclk time name as the original cube, except that they will have appended to the name _nnn, where nnn is the number of the cube in time order extracted from the packed cube. So a packed cube containing 8 cubes would be extracted into 8 cubes, named v<sclk>_V#_001, v<scllk>_V#_002, ... v<sclk>V#_008, where v stands for VIMS, V# is the version number, and 001, 002, etc. are the numbers of the unpacked cubes in time order. Each cube header will be adjusted internally to reflect the actual start time of the cube.

Within each data subdirectory, the data files will be stored with attached ISIS labels and detached PDS labels. The VIMS team will generate PDS labels upon completion of data acquisition. A detailed description of the keywords in the labels can be found in the dpsis.txt file.

VIMS data files are named according to the form V<sclk>_<ver>.<ext> where

"V" stands for VIMS,
<sclk> is the spacecraft clock time,
<ver> is the version number, and
<ext> is the PDS data type extension,

Thus producing a data filename such as "V1402898283_4.QUB". The corresponding detached PDS label file consists of the same name as the data file except for a different extension. The name of the label file ends with ".LBL", thus producing a label filename such as "V1402898283_4.LBL".

2.3. Index Directory Contents

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

---

File Name	File Contents	Provided By
indxinfo.txt	A description of the contents of this directory.	VIMS Team
index.tab	A table listing all data products on this volume.	VIMS Team
index.lbl	A PDS detached label that describes the format of the INDEX.TAB	VIMS Team
cumindex.tab	A table listing all data products on this volume and other volumes.	VIMS Team
cumindex.lbl	A PDS detached label that describes the format of the CUMINDEX.TAB	VIMS Team

2.4. Document Directory Contents

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

File Name	File Contents	Provided By
docinfo.txt	A description of the contents of this directory.	VIMS Team
dpsis.txt	The Data Product SIS as a text file.	VIMS Team
archsis.txt	The Archive Volume SIS (this file) as a text file.	VIMS Team

2.5. Catalog Directory Contents:

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

File Name	File Contents	Provided By
catinfo.txt	A description of the contents of this directory.	VIMS Team
dataset.cat	Data set information for the PDS catalog.	VIMS Team
insthost.cat	Instrument host information for the PDS catalog.	Cassini Project

inst.cat	Instrument information for the PDS catalog.	VIMS Team
mission.cat	Mission information for the PDS catalog.	Cassini Project
person.cat	Personnel information for the PDS catalog (Team and PDS personnel responsible for generating the archive)	VIMS Team
projref.cat	References sited in the mission.cat and insthost.cat files.	Cassini Project
ref.cat	References mentioned in other *.CAT files	VIMS Team & Cassini Project
software.cat	ISIS and other calibration software information for the PDS catalog.	VIMS Team

2.6. Label Directory Contents

The Label Directory contains .fmt files that describe data format and organization. These files are referred to in the PDS labels that accompany the data products. These FMT files are to be parsed like include files as if they were part of the PDS labels that refer to them.
The following files are contained in the Label Directory.

File Name	File Contents	Provided By
labinfo.txt	A description of the contents of this directory.	VIMS Team
core_description.fmt	A description of the maximums, minimums, etc. of the core data.	VIMS Team
suffix_description.fmt	A description of the maximums, minimums, etc. of the suffix data.	VIMS Team
band_bin_center.fmt	Spectral axis description	VIMS Team

2.7. Software Directory Contents

The Software Directory contains utilities or application programs to aid
the user in viewing or extracting data from the data product files. The following files are contained in the Software Directory.

File Name	File Contents	Provided By

softinfo.txt	A description of the contents of this directory.	VIMS Team

2.8. Calibration Directory Contents

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

File Name	File Contents	Provided By
calinfo.txt	A description of the contents of this directory	VIMS Team
ir_flatfield.qub	VIMS IR Flatfield cube.	VIMS Team
ir_flatfield.lbl	PDS compliant label associated with the IR Flatfield cube	VIMS Team
ir_flatfield_ss.qub	spectral summing version.	VIMS Team
ir_flatfield_ss.lbl	spectral summing version.	VIMS Team
vis_hires_dark_model.tab	VIMS VIS HI-RES Dark Model Table.	VIMS Team
vis_hires_dark_model.lbl	PDS compliant label associated with the VIS HI-RES Dark Model Table.	VIMS Team
vis_lowres_dark_model.tab	VIMS VIS LOW-RES Dark Model Table.	VIMS Team
vis_lowres_dark_model.lbl	PDS compliant label associated with the VIS LOW-RES Dark Model Table.	VIMS Team
ir_nyquist_flatfield.qub	VIMS IR Nyquist Flatfield cube.	VIMS Team
ir_nyquist_flatfield.lbl	PDS compliant label associated with the IR Nyquist Flatfield cube.	VIMS Team
ir_nyquist_flatfield_ss.qub	spectral summing version.	VIMS Team
ir_nyquist_flatfield_ss.lbl	spectral summing version.	VIMS Team
ir_hires_flatfield.qub	VIMS IR High Resolution Flatfield cube.	VIMS Team

ir_hires_flatfield.lbl	PDS compliant label associated with the VIS High Resolution Flatfield cube.	VIMS Team
ir_hires_flatfield_ss.qub	spectral summing version.	VIMS Team
ir_hires_flatfield_ss.lbl	spectral summing version.	VIMS Team
vis_flatfield.qub	VIMS Visual Flatfield cube.	VIMS Team
vis_flatfield.lbl	PDS compliant label associated with the IR Flatfield cube.	VIMS Team
vis_flatfield_ss.qub	spectral summing version.	VIMS Team
vis_flatfield_ss.lbl	spectral summing version.	VIMS Team
vis_hires_flatfield.qub	VIMS VIS High Resolution Flatfield cube.	VIMS Team
vis_hires_flatfield.lbl	PDS compliant label associated with the VIS High Resolution Flatfield cube.	VIMS Team
vis_hires_flatfield_ss.qub	spectral summing version.	VIMS Team
vis_hires_flatfield_ss.lbl	spectral summing version.	VIMS Team
solar.qub	VIMS Solar color cube.	VIMS Team
solar.lbl	PDS compliant label associated with the Solar color cube.	VIMS Team
solar_ss.qub	spectral summing version.	VIMS Team
solar_ss.lbl	spectral summing version.	VIMS Team
ir_perf.qub	A vector that maps VIMS IR DNs to photons for the VIMS boresight pixel.	VIMS Team
ir_perf.lbl	PDS compliant label associated with the VIMS IR performance cube.	VIMS Team
ir_perf_ss.qub	spectral summing version.	VIMS Team
ir_perf_ss.lbl	spectral summing version.	VIMS Team
vis_perf.qub	A vector that maps VIMS VIS DNs to photons for the VIMS boresight pixel.	VIMS Team

vis_perf.lbl	PDS compliant label associated with the VIMS VIS performance cube.	VIMS Team
vis_perf_ss.qub	spectral summing version.	VIMS Team
vis_perf_ss.lbl	spectral summing version.	VIMS Team
wavecal.qub	VIMS wave calibration cube	VIMS Team
wavecal.lbl	PDS compliant label associated with the VIMS wave calibration cube.	VIMS Team
wavecal_ss.qub	spectral summing version.	VIMS Team
wavecal_ss.lbl	spectral summing version.	VIMS Team

3. Archive Volume Format

This section describes the format of the VIMS Archive Volumes. Data that comprise the Archive will be formatted in accordance with Planetary Data System specifications [Applicable Documents 4 and 5].

3.1. File Formats

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

3.1.1. Document File Format

Document files with the .txt suffix exist in the Root, Index, Document, Calibration, Catalog, Label and Software directories. They are flat ASCII text files, which may have embedded PDS labels. Plain text files have line length restricted to 78 characters or fewer, to accommodate printing and display on standard devices. Each line will be terminated by the two-character carriage-return/linefeed sequence, <CR><LF> (ASCII decimal character codes 13 and 10, respectively), for a maximum total line length of 80 characters.

In general, documents are provided in ASCII text format (.txt). However, when a document contains formatting and/or images/figures that cannot be rendered as ASCII text, they will be given in Portable Document Format. Portable Document Format (PDF) is a proprietary format of Adobe Systems, Incorporated that is frequently used for distributing documents.
Adobe offers free software, Acrobat Reader, for viewing PDF files.

3.1.2. Tabular File Format

Tabular files (.tab suffix) exist in the Index directory. Tabular files are ASCII files formatted for direct reading into many database management systems on various computers. All fields are separated by

commas, and character fields are enclosed in double quotation marks (").
(Character fields are padded with spaces to keep quotation marks in the same columns of successive records.) Character fields are left justified, and numeric fields are right justified. The "start byte" and "bytes" values listed in the labels do not include the commas between fields or the quotation marks surrounding character fields. The records are of fixed length, and the last two bytes of each record contain the ASCII carriage return/line feed character sequence, <CR><LF>. This allows a table to be treated as a fixed length record file on computers that support this file type and as a text file with embedded line delimiters on those that don't.

Detached PDS labels will describe tabular files. A detached PDS label file has the same name as the data file it describes, with the extension
.lbl; for example, the file index.tab is accompanied by the detached label file index.lbl in the same directory.

3.1.3. PDS Label Format

All data files (.qub) in the archive have PDS labels, detached in a separate file. For an example of a VIMS Qube PDS label, see Appendix B of the VIMS Archive Volume SIS [This document].

3.1.4. Software File Format

The scripts are written in C and IDL. A software package called ISIS is also necessary to run some scripts. Compiled executables are provided
for Enterprise Linux.

3.1.5. Catalog File Format

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

Each line must be terminated by the two-character carriage-return/linefeed sequence, <CR><LF> (ASCII decimal character codes 13 and 10, respectively). Catalog files have line length restricted to 72 characters or fewer, including the <CR><LF>, to accommodate PDS data ingestion requirements set forth by their internal catalogs and databases.

3.1.6. Science Data File Formats

3.1.6.1. VIMS_RAW_QUB Data Product

This will be an ISIS compliant format that consists of a PDS like header
with keyword = value syntax followed by core and suffix values in binary
format. For detailed information on the VIMS_RAW_QUB data product format see the Data Product SIS [Applicable Document 3].

4. Archive Volume Generation

4.1. Data Transfer Methods and Archive Volume Creation

The VIMS EDRs for all phases of the mission will be converted into ISIS cubes by the MIPS of the Jet Propulsion Laboratory (JPL), after which they will then be transferred to the VIMS science team for subsequent generation of detached PDS labels.

The VIMS Archive Collection will include all ISIS cubes received by the VIMS science team, as described in the specifications detailed in Applicable Document #3. These data will cover the Cassini cruise to Saturn, including the science and calibration data from launch to SOI as
well as the primary Saturn tour mission.

The VIMS science team will generate the detached PDS labels for the data
files, and assemble and produce the PDS-compliant archive volumes. They will then generate two DVD-R copies of these volumes, one to be delivered to the PDS Imaging Node at JPL and one to be archived at the University of Arizona. PDS Imaging Node will duplicate the received volumes and provide two additional DVD-R copies to be distributed to the
PDS Central Node and the National Space Science Data Center (NSSDC).

4.2. Validation Methods

Validation is the method by which data products and volumes are validated in accordance with the standards identified in the Planetary Data System Standards Reference document [Applicable Document #6].

Data products and the archive volumes are validated by a collaborative effort between the Cassini/VIMS team, the Imaging and Central Nodes of the PDS, and outside scientists. The Cassini/VIMS team is responsible for product infrastructure and completeness of documentation.

Any deficiencies found in the archive volume will be corrected and a second review will be conducted. Once correctable errors have been resolved, production of the archive volumes will proceed with the PDS and the Cassini/VIMS team performing additional spot check validation. Non-correctable errors (i.e., an error in the downlink data file) will be described in the cumulative errata file, errata.txt that is included on each volume in the volume set.

4.3. Data Product Sizes and Delivery Rates

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

Table 1 - Standard Product Sizes and Delivery Rates

Data Set ID:	CO-E/V/J/S-VIMS-2-QUBE-V1.0
Production Rate (Gbytes/month):	3.1
Expected Total Data Volume for Primary Mission (Gbytes):	150

4.4. Archive Media Characteristics

All VIMS standard product archive volumes have a Digital Versatile Disk (DVD-ROM or DVD-R) format that is produced in UDF-Bridge format (Universal Disc Format) with ISO 9660 level 1 compatibility. [Applicable Documents 5 and 6].

4.5. Backup and Duplicates

At an absolute minimum, two physical media copies of each volume will be produced by the University of Arizona along with the PDS Imaging Node, combined, from the validated write once physical media delivered to the PDS Imaging Node from the VIMS science team. Until these volumes have been produced, or one validated write-once copy has been received by the PDS, volume contents shall be stored by the VIMS science team, either on magnetic disc or write-once physical media.

4.6. Labeling and Identification

The VIMS volume set is comprised of one sequence of volumes with the following naming scheme:

VOLUME_SERIES_NAME:	MISSION TO SATURN
VOLUME_SET_NAME:	CASSINI: VISUAL AND INFRARED MAPPING SPECTROMETER QUBE EDR
VOLUME_SET_ID:	USA_NASA_PDS_COVIMS_0XXX
VOLUME_ID:	COVIMS_0XXX

5. Support Staff and Cognizant Persons

Robert H. Brown
VIMS Team Lead

Virginia Smith
VIMS Team Archivist

John Ivens
VIMS Team Systems Programmer

Diane Conner
Cassini Project Archive Coordinator

John Diehl
PDS Imaging Node contact

Rafael Alanis
PDS Imaging Node contact

Appendix A. Detached Planetary Data System (PDS) Label

Corresponding to each Qube data file is a detached ASCII PDS label file.
This file is included in order to make the VIMS products PDS-compliant. For file naming convention of the VIMS PDS label files, see section 2.2,
"Data Directory Contents and Naming", of this document.

The PDS Spectral QUBE is identical in data structure to the ISIS Standard Qube, except for some special requirements that are imposed by the ISIS system on Qube labels, such as a mandatory association of a Qube object with a History object. The PDS has no such requirements except for a required and optional core set of keywords that make the Qube more generalized. Also, because the ISIS system was designed before
the current version of the Planetary Science Data Dictionary, some of the element names conflict with current PDS nomenclature standards.

Most VIMS PDS label keywords, and their definitions, which map exactly to keywords in the associated Qube data file are found in Table 3.3, "Qube Object Keywords", of [Applicable Document 3]. Any remaining keyword disparities can be resolved by consulting the Planetary Science Data Dictionary.

For more specific information regarding the structure of the PDS Spectral Qube object or PDS labels in general, please see the PDS Standards Reference [Applicable Document 5].

Appendix B. Sample Detached PDS Label

```
PDS_VERSION_ID                  = PDS3

/* File Structure */

RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = 512
FILE_RECORDS                    = 2275

/* Pointers to Data Objects */

^HEADER                         = ("v1466082196_1.qub", 1)
^HISTORY                        = ("v1466082196_1.qub", 23)
^QUBE                           = ("v1466082196_1.qub", 48)

/* Identification Data Elements */

MISSION_NAME                    = "CASSINI-HUYGENS"
MISSION_PHASE_NAME              = "TOUR PRE-HUYGENS"
INSTRUMENT_HOST_NAME            = "CASSINI ORBITER"
INSTRUMENT_NAME                 = "VISUAL AND INFRARED MAPPING
                                   SPECTROMETER"
INSTRUMENT_ID                   = VIMS
DATA_SET_ID                     = "CO-E/V/J/S-VIMS-2-QUBE-V1.0"
PRODUCT_ID                      = "1_1466082196.13981"
PRODUCT_VERSION_TYPE            = "FINAL"
FLIGHT_SOFTWARE_VERSION_ID      = "8.1"
```

```
SOFTWARE_VERSION_ID              = "VIMS 10.0 03-02-2004"
TARGET_NAME                      = "SATURN"
TARGET_DESC                      = "RINGS"
IMAGE_OBSERVATION_TYPE           = SCIENCE
SPACECRAFT_CLOCK_CNT_PARTITION   = 1
SPACECRAFT_CLOCK_START_COUNT     = "1/1466082207.188"
SPACECRAFT_CLOCK_STOP_COUNT      = "1/1466082468.032"
NATIVE_START_TIME                = "1466082196.13981"
NATIVE_STOP_TIME                 = "1466082456.00097"
START_TIME                       = 2004-168T12:39:09.911
STOP_TIME                        = 2004-168T12:43:29.041
HOUSEKEEPING_CLOCK_COUNT         = 1466082435.144
PRODUCT_CREATION_TIME            = 2004-169T13:31:26.000
OBSERVATION_ID                   = "VIMS_000RI_RINGMOS105_PRIME"
COMMAND_FILE_NAME                = "VIMS_000RI_RINGMOS105_PRIME.V4.ioi"
COMMAND_SEQUENCE_NUMBER          = 110
EARTH_RECEIVED_START_TIME        = 2004-169T11:33:20.149
EARTH_RECEIVED_STOP_TIME         = 2004-169T11:36:03.927
MISSING_PACKET_FLAG              = NO
DESCRIPTION                      = "N/A"
PARAMETER_SET_ID                 = "VIMS_000RI_RINGMOS105_PRIME_006"
SEQUENCE_ID                      = "S01"
SEQUENCE_TITLE                   = "VIMS_000RI_RINGMOS105_PRIME"
TELEMETRY_FORMAT_ID              = UNK
DATA_REGION                      = "N/A"
OVERWRITTEN_CHANNEL_FLAG         = OFF

/* Instrument Status (IR, Visible)
   In the following section, parameters with single values apply to
   both the IR and visible portions of the instrument.   Parameters
   with two values apply to the IR and the visible respectively.  For
   parameters with more than two values, see the accompanying comment
   for an indication of how the values are to be applied. */

INSTRUMENT_MODE_ID               = "IMAGE"
INTERFRAME_DELAY_DURATION        = 520.000000
COMPRESSOR_ID                    = 1
INST_CMPRS_NAME                  = "OMEGA"
INST_CMPRS_RATIO                 = 3.521949
DATA_BUFFER_STATE_FLAG           = ENABLED
INSTRUMENT_DATA_RATE             = 94.208000
MISSING_PIXELS                   = 0
POWER_STATE_FLAG                 = (ON,ON)
GAIN_MODE_ID                     = (LOW,LOW)
EXPOSURE_DURATION                = (160.000000,10000.000000)
BACKGROUND_SAMPLING_MODE_ID      = (SINGLE,ZERO_SUB)
X_OFFSET                         = 1
Z_OFFSET                         = 1
SWATH_WIDTH                      = 64
SWATH_LENGTH                     = 24
SPECTRAL_EDITING_FLAG            = OFF
SPECTRAL_SUMMING_FLAG            = OFF
OFFSET_FLAG                      = OFF
SNAPSHOT_MODE_FLAG               = OFF
PACKING_FLAG                     = OFF

/* Temps shown are IR high res, IR low res, Visible (degrees K) */
```

```
DETECTOR_TEMPERATURE            = (59.650791,58.759590,234.399765)

/* Temps shown are IR primary, IR secondary, Visible (degrees K) */

OPTICS_TEMPERATURE              = (133.989594,127.174942,274.901215)

/* Sampling modes shown are IR, visible spatial, and visible spectral
*/

SAMPLING_MODE_ID                = ("NORMAL","NORMAL")

/* Instrument status: IR */

BIAS_STATE_ID                   = LOW
SCAN_MODE_ID                    = BOTH
SHUTTER_STATE_FLAG              = ENABLED
INTEGRATION_DELAY_FLAG          = DISABLED
INTERLINE_DELAY_DURATION        = 415.000000
BACKGROUND_SAMPLING_FREQUENCY   = 1

/* Temperatures shown are for spectrometer, then grating (degrees K).
*/

INSTRUMENT_TEMPERATURE          = (130.267487,129.860535)
FAST_HK_ITEM_NAME               = ("IR_DETECTOR_TEMP_HIGH_RES_1",
                                   "IR_GRATING_TEMP",
                                   "IR_PRIMARY_OPTICS_TEMP",
                                   "IR_SPECTROMETER_BODY_TEMP_1")
FAST_HK_PICKUP_RATE             = 2

/* Instrument status: visible */

ANTIBLOOMING_STATE_FLAG         = OFF

/* Data Object Definitions */

OBJECT                          = HEADER
  BYTES                         = 11264
  HEADER_TYPE                   = ISIS
  INTERCHANGE_FORMAT            = ASCII
END_OBJECT                      = HEADER

OBJECT                          = HISTORY
  BYTES                         = 12800
  HISTORY_TYPE                  = ISIS
  INTERCHANGE_FORMAT            = ASCII
END_OBJECT                      = HISTORY

OBJECT                          = SPECTRAL_QUBE
  AXES                          = 3
  AXIS_NAME                     = (SAMPLE,BAND,LINE)
  FILE_STATE                    = CLEAN
  CHECKSUM                      = 2621418145

/* Core description. */
```

```
  CORE_ITEMS                    = (64,352,24)
  ^STRUCTURE                    = "CORE_DESCRIPTION.FMT"

/* Suffix description. */

  SUFFIX_ITEMS                  = (1,4,0)
  SAMPLE_SUFFIX_NAME            = BACKGROUND
  BAND_SUFFIX_NAME              = (IR_DETECTOR_TEMP_HIGH_RES_1,

IR_GRATING_TEMP,IR_PRIMARY_OPTICS_TEMP,
                                   IR_SPECTROMETER_BODY_TEMP_1)
  ^STRUCTURE                    = "SUFFIX_DESCRIPTION.FMT"

/* Spectral axis description */

  ^STRUCTURE                    = "BAND_BIN_CENTER.FMT"
END_OBJECT                      = SPECTRAL_QUBE
```

Appendix C. Sample index.lbl file

```
PDS_VERSION_ID          = PDS3
LABEL_REVISION_NOTE     = "2004-10-1, Initial"
RECORD_TYPE             = STREAM
RECORD_BYTES            = 361
FILE_RECORDS            = TBD
^INDEX_TABLE            = "index.tab"
VOLUME_ID               = TBD
DATA_SET_ID             = "CO-E/V/J/S-VIMS-2-QUBE-V1.0"
PRODUCT_CREATION_TIME   = TBD
SPACECRAFT_NAME         = "CASSINI ORBITER"
INSTRUMENT_HOST_ID      = "CO"
INSTRUMENT_NAME         = "VISUAL AND INFRARED MAPPING SPECTROMETER"
INSTRUMENT_ID           = "VIMS"
MINIMUM_WAVELENGTH      = 0.3
MAXIMUM_WAVELENGTH      = 5.1

For full definitions of index fields, please refer to Operator's
Handbook.

OBJECT                  = INDEX_TABLE
  INTERCHANGE_FORMAT      = ASCII
  ROWS                    = TBD
  COLUMNS                 = 21
  ROW_BYTES               = 361
  INDEX_TYPE              = SINGLE

OBJECT                  = COLUMN
  NAME                    = FILE_NAME
  DATA_TYPE               = CHARACTER
  START_BYTE              = 2
  BYTES                   = 25
  DESCRIPTION             = "Name of file in the directory"
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = PATH_NAME
```

```
  DATA_TYPE               = CHARACTER
  START_BYTE              = 30
  BYTES                   = 35
  DESCRIPTION             = "POSIX-compliant full path to the PDS label
    file."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = SEQ_ID
  DATA_TYPE               = CHARACTER
  START_BYTE              = 68
  BYTES                   = 3
  DESCRIPTION             = "Sequence id:
    1st character is either C or S indicating Cruise or Tour,
respectively.
    2nd and 3rd characters indicate sequence number"
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = START_TIME
  DATA_TYPE               = TIME
  START_BYTE              = 73
  BYTES                   = 23
  DESCRIPTION             = "Spacecraft Event Time (SCET) of the VIMS
IR
    shutter opening in the format YYYY-MM-DDThh:mm:ss.[fff], where
    YYYY is the year, MM is the month, DD is the day,  hh is the
    hour, mm is the minutes, and ss.[fff] are the seconds."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = STOP_TIME
  DATA_TYPE               = TIME
  START_BYTE              = 97
  BYTES                   = 23
  DESCRIPTION             = "Spacecraft Event Time (SCET) of the VIMS
IR
    shutter closing in the format YYYY-MM-DDThh:mm:ss.[fff], where
    YYYY is the year, MM is the month, DD is the day,  hh is the
    hour, mm is the minutes, and ss.[fff] are the seconds."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = SPACE_CLOCK_START_COUNT
  DATA_TYPE               = CHARACTER
  START_BYTE              = 122
  BYTES                   = 20
  DESCRIPTION             = "Spacecraft clock start count reading of
the
    VIMS IR shutter opening."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = SPACE_CLOCK_STOP_COUNT
  DATA_TYPE               = CHARACTER
  START_BYTE              = 145
  BYTES                   = 20
```

```
  DESCRIPTION             = "Spacecraft clock stop count reading of the
    VIMS IR shutter closing."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = TARGET_NAME
  DATA_TYPE               = CHARACTER
  START_BYTE              = 168
  BYTES                   = 30
  DESCRIPTION             = "The target name identifies the primary
    target of the observation."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = INSTRUMENT_MODE_ID
  DATA_TYPE               = CHARACTER
  START_BYTE              = 201
  BYTES                   = 20
  DESCRIPTION             = "The mode in which the instrument is
    acquiring data, most commonly IMAGE but also LINE, POINT,
    OCCULTATION, CAL_SOLAR, CAL_SPECTRAL, CAL_BACKGROUND, or
    CAL_ELECTRIC."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = OBSERVATION_ID
  DATA_TYPE               = CHARACTER
  START_BYTE              = 224
  BYTES                   = 30
  DESCRIPTION             = "A string that consists of the
    instrument, the orbit number, the target code, a description
    of the observation, and instance number.  For example,
    VIMS_000PH_PHOEBE031 is data of PHOEBE taken by VIMS during
    orbit 000."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = SPECTRAL_EDITING
  DATA_TYPE               = CHARACTER
  START_BYTE              = 257
  BYTES                   = 3
  DESCRIPTION             = "Indicates whether this cube has been
reduced
  to a subset of the bands in the original cube.  If "OFF", none of the
  original bands of the cube were intentionally omitted. See
  BAND_BIN_ORIGINAL_BAND to determine which bands are present."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = SPECTRAL_SUMMING
  DATA_TYPE               = CHARACTER
  START_BYTE              = 263
  BYTES                   = 3
  DESCRIPTION             = "Indicates whether this cube has had some
  bands summed to reduce the SSR data volume.  See
  BAND_BIN_ORIGINAL_BAND to determine which bands have been summed."
END_OBJECT              = COLUMN
```

```
OBJECT                   = COLUMN
  NAME                     = STAR_TRACKING
  DATA_TYPE                = CHARACTER
  START_BYTE               = 269
  BYTES                    = 3
  DESCRIPTION              = "Normally, the VIMS field of view is
changed
  by altering the size (SWATH_WIDTH and SWATH_LENGTH) of the subset of
  the array and by changing the position of that subset (X_OFFSET and
  Z_OFFSET) within the array.  This is the default, when STAR_TRACKING
  is OFF.  When STAR_TRACKING is ON, the tracking is accomplished by
  causing the instrument to ignore the supplied X and Z offsets in the
  instrument setup, and instead track the brightest pixel in the array
  as it moves over time.  The brightest pixel is set in the instrument
  by running a previous instrument setup (of a minimal size), which
will
  cause the X and Z position of the brightest pixel to be automatically
  set inside the instrument.  This position is then used as the initial
  brightest pixel, and it will be tracked over the life of this setup."
END_OBJECT               = COLUMN

OBJECT                   = COLUMN
  NAME                     = SWATH_WIDTH
  DATA_TYPE                = INTEGER
  START_BYTE               = 274
  BYTES                    = 2
  DESCRIPTION              = "The number of pixels (in the X direction)
  collected during an observation.  This will differ from
  CORE_ITEMS (1) for Occultation Mode cubes.  The angular size of these
  pixels is dependent upon the resolution mode selected."
END_OBJECT               = COLUMN

OBJECT                   = COLUMN
  NAME                     = SWATH_LENGTH
  DATA_TYPE                = INTEGER
  START_BYTE               = 277
  BYTES                    = 2
  DESCRIPTION              = "The number of slices (in the Z direction)
  c  ollected during an observation.  This will differ from
  CORE_ITEMS (3) for all packed cubes and Occultation Mode cubes.
  The angular size of these lines is dependent upon the resolution
  mode selected."
END_OBJECT               = COLUMN

OBJECT                   = COLUMN
  NAME                     = IR_EXPOSURE
  DATA_TYPE                = REAL
  START_BYTE               = 280
  BYTES                    = 10
  DESCRIPTION              = "The IR exposure time for each pixel,
    in milliseconds."
END_OBJECT               = COLUMN

OBJECT                   = COLUMN
  NAME                     = IR_SAMPLING_MODE_ID
  DATA_TYPE                = CHARACTER
```

```
  START_BYTE              = 292
  BYTES                   = 8
  DESCRIPTION             = "A two-valued array describing the
  resolution mode of the IR channel, and the spatial resolution
  mode of the VIS channel. "N/A" is used if the channel is
  powered OFF."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = VIS_EXPOSURE
  DATA_TYPE               = REAL
  START_BYTE              = 302
  BYTES                   = 10
  DESCRIPTION             = "The VIS exposure time for each line,
    in milliseconds."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = VIS_SAMPLING_MODE_ID
  DATA_TYPE               = CHARACTER
  START_BYTE              = 314
  BYTES                   = 8
  DESCRIPTION             = "A two-valued array describing the
  resolution mode of the IR channel, and the spatial resolution
  mode of the VIS channel. "N/A" is used if the channel is
  powered OFF."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = PRODUCT_ID
  DATA_TYPE               = CHARACTER
  START_BYTE              = 325
  BYTES                   = 22
  DESCRIPTION             = "A permanent, unique identifier assigned
  to a data product by its producer.  The product id is the sclk
  string that represents the spacecraft time at the moment that the
  data was taken.  The SCLK string is a spacecraft timing partion
  (usually 1) followed by a forward slash followed by the spacecraft
  clock value (an integer representing the amount of time since the
  spacecraft partition became active.  For example: 1/1356766628."
END_OBJECT              = COLUMN

OBJECT                  = COLUMN
  NAME                    = VOLUME_ID
  DATA_TYPE               = CHARACTER
  START_BYTE              = 350
  BYTES                   = 11
  DESCRIPTION             = "Name of the volume id which the data cube
    resides."
END_OBJECT              = COLUMN

END_OBJECT              = INDEX_TABLE
END


END Infrared Mapping Spectrometer (VIMS) Tour Level 1A
```