Cassini Imaging Science Subsystem (ISS) Tour VICAR Image Data File and Detached Planetary Data System (PDS) Label

Software Interface Specification (SIS)

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Tour Version 1.1

JPL D-24724, DOIS-002

Custodian: A. Culver, December 1, 2004

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Change Log:

Date	*Author of Changes*	*Description*
May, 2000	Amy Culver	1) Replaced property label keyword tables (Section 6.2.3) with version negotiated and accepted by PDS Central and Imaging Nodes. 2) Updated formatting and content of other tables for consistency.
July, 2000	Amy Culver	Updated catalog-based sources to reflect new field names in Cassini tables.
August, 2000	Amy Culver	Added new keywords.
May, 2001	Amy Culver	Modified description of BIAS_STRIP_MEAN. Updated binary line prefix to describe overclocked pixel data returned by new version of flight software.
September, 2002	Amy Culver	Initial Release for Tour. Where changes are noted, they are relative to the Cruise VICAR label SIS (D-18976 • Changed title, D# • Fortified Introduction - Overview • Incorporated detached PDS label and added PDS signatory. • Removed the following keywords:

		CALIBRATION_LAMP_DURATION, NOTE.
		• Changed definition of the following keywords:
		  • IMAGE_TIME now reflects midpoint of exposure, instead of shutter close time.
		  • NOTE renamed to DESCRIPTION, now 255 chars instead of previous PDS limit of 60 chars.
		  • Added valid values for IMAGE_OBSERVATION_TYPE.
		  • Corrected valid range of values for blocks per GOB in both INST_CMPRS_PARAM and binary header.
		  • Updated valid values of keywords affected by a missing extended header.
		  • Changed source of FLIGHT_SOFTWARE_VERSION_ID MISSION_PHASE_NAME. Included references to MIPL Tour database where appropriate.
		  • Updated range of valid values for COMMAND_SEQUENCE_NUMBER.
		  • Changed valid values of DATA_SET_ID, MISSION_NAME and MISSION_PHASE_NAME.

		• Added the following keywords:
		  • EXPECTED_MAXIMUM(full well, max DN)
		  • EXPECTED PACKETS
		  • INST_CMPRS_RATE (expected, actual)
		  • METHOD_DESC
		  • RECEIVED PACKETS
		  • TARGET_DESC
		  • TELEMETRY_FORMAT_ID
		  • VALID_MAXIMUM(full well, max DN). Includes new table in Appendix A.
		• Clarified description of bit & byte ordering.
		• Added wavelengths to FILTER_NAME table in Appendix A.
		• Made OPTICS_TEMPERATURE a two-valued array pertaining to front and rear optics temps.
		• Added acronyms to Appendix B.
		• Removed “Defaults” column, migrated info to “Valid Values” column.

September 30, 2002	Amy Culver	•Modified valid value of DATA_SET_ID per PDS recommendataion. Updated sample labels.

		• Corrected typos. • Included configuration management section.
October 3, 2002	Amy Culver with IO/ISS Team/PDS at Boulder	Changed reference to PERCENT_FULL_WELL and PERCENT_MAX_DN to EXPECTED_MAXIMUM_* to reflect changes in IOI file. Changed file naming convention for products and labels to conform to PDS standards. Added ORDER_NUMBER, SEQUENCE_NUMBER and TARGET_LIST keywords. Updated source for items from IOI which moved from header to param set table. Made IMAGE_OBSERVATION_TYPE a multivalued arrary. Updated descriptions of MISSING_LINES, MISSING_PACKET_FLAG, SEQUENCE_TITLE. Updated VALID_MAXIMUM table in Appendix A. Reverted to previous definition of IMAGE_TIME (same as STOP_TIME). Added new keyword, IMAGE_MID_TIME. Updated example labels.
October 18, 2002	Amy Culver	Revised to clarify/clean up as needed: • Returned SHUTTER_STATE_ID keyword to Section 6.3 (inadvertently deleted during 10/3/02 editing.)

		• Returned INSTRUMENT_MODE_ID keyword to Table 7.2.3.5 (inadvertently deleted during 10/3/02 editing.) • For IMAGE_OBSERVATION_TYPE, VICAR requires list to be specified within parenthesis, not curly braces (as is the case for the PDS label.) Updated VICAR sections accordingly. • Updated range for EXPECTED_PACKETS in PDS label (should be 1-2277 as in VICAR label.) • Updated Table 8.5 per Vance Haemmerle/ Bob West. Table now reflects minimum full well saturation (to be used as VALID_MAXIMUM) which may exceed 4095. • Cleaned up wording about case when shutter is inhibited for IMAGE_TIME and IMAGE_MID_TIME. • Added clarification about filenames for preliminary products created without predict information.
November, 2002	Amy Culver	• Updated source of fields coming from MIPL database to reflect actual field names.
November 19 - 22, 2002	Amy Culver	• Clarified source of keyword values when extended header is missing • Clarified source of INSTRUMENT_DATA_RATE • Updated sample labels to reflect two valued array for OPTICS_TEMPERATURE. Also corrected order of keywords to be alphabetical. • Added default value for

		TELEMETRY_FORMAT_ID. • Corrected quote fomatting used in tables to describe IMAGE_OBSERVATION_TYPE. (Single vs. double quotes reversed for PDS and VICAR label.)
December 5, 2002	Amy Culver	• Corrected example preliminary file names (removed colons) • Corrected references for NBB, NLB (should be sections 7.4.2 and 7.3.2)
December, 2004	Amy Culver	Modified the following fields due to ISS FSW 1.4 changes. (ECR 103650): • DARK_STRIP_MEAN description in Tables 6.3 and 7.2.3.4 • The PDS pointer to the LINE_PREFIX_STRUCTURE in Table 6.4. • The binary line prefix extended pixel value in Table 7.4.2 • Updated the BLTYPE in the VICAR label to reference new binary line prefix format. Added <DEGC> annotation to PDS sample label DETECTOR_TEMPERATURE so value does not conflict with PDS Data Dictionary definition. Added Appendix E to clarify BIAS_STRIP_MEAN and DARK_STRIP_MEAN contents depending on the FLIGHT_SOFTWARE_VERSION_ID. Corrected erroneous PRODUCT_ID in the sample

		labels. Removed trailing “Z” from PRODUCT_CREATION_TIME in sample labels, as this time is local, not UTC. Clarified descriptions for BIAS_STRIP_MEAN, DELAYED_READOUT_FLAG, INST_CMPRS RATIO, INSTRUMENT_DATA_RATE, PRODUCT_CREATION_TIME, TARGET_DESC. Corrected values, conversion mapping and field locations in the Binary Header (Table 7.3.2). Updated READOUT_CYCLE_INDEX (Table 8.4) to reflect total readout time for single camera events.

1. INTRODUCTION

1.1 Overview

This Software Interface Specification describes the content and format of the Imaging Science Subsystem (ISS) image data files and detached Planetary Data System (PDS) labels generated by the Instrument Operations (IO) ISS operations software. There is a one-to-one-correspondence between image data files and detached PDS labels. The PDS label file contains pointers to the associated image data file. Each product delivery from IO to the ISS Science Team consists of both files.

The files generated by IO and conforming to this SIS are operational versions of the images and labels. They resemble archive products as closely as possible, and the contents have been negotiated and accepted by the signatories, plus the Cassini Archive Engineer. There are areas where the operational products will need slight modifications in order to generate the final archive products - potentially the OBSERVATION_ID and the TARGET_NAME keywords. These label keywords are addressed in Sections 6 and 7.

Each product data file has been reconstructed from telemetry packets into an image. The image has not been radiometrically or geometrically corrected. These image data files are considered to be “Level 2” according to the Committee on Data Management and Computation (CODMAC), and processing “Level 0” according to NASA.

The ISS Science Team will provide and archive software to perform radiometric correction on archive versions of these product files. The product data files and labels, in combination with the radiometric correction software and calibration files form a product the Cassini Project currently refers to as “Level 1A”.

For background information about the camera operations, consult the “Cassini Imaging Science Subsystem Instrument Operations Handbook” (see References).

1.2 Scope

This specification applies to ISS data collected after January, 2003, including Saturn Approach Science, Saturn Orbit Insertion, and Tour Operations.

This SIS is intended to provide enough information to enable users to read and understand the data product. This SIS is intended for use by the ISS team scientists who will analyze and ultimately archive the data, the Navigation Team and Principle Investigators who request Support Imaging products.

1.3 Applicable Documents

- ISS Flight Software: Software Requirements Document, M. Girard, 10/15/93, D-10750
- EGSE Functional Requirements Document, J. Gerhard, 11/6/92, ISS Document Number 8.3.2.
- *VICAR File Format*, R. Deen, JPL Inter Office Memorandum IPSD:384-92-196, 9/25/92
- EGSE VICAR Image Data File, JPL D-15683, 1 April 1998
- "Planetary Data System Standards Reference", Version 3.4, June 15, 2001, JPL D-7669, Part 2
- "Cassini Imaging Science Subsystem Instrument Operations Handbook", Version 1.0, JPL D-18628, 1 May 2000
- "Cassini Imaging Science Subsystem Southwest Research Institute Boulder,CO/Instrument Operations Instrument Operations Interface", J. Diehl and E. Sayfi, 09/17/02, Version 2.2, D-18981
- "Imaging Science Subsystem Calibration Report", Charles Avis and James Gerhard, JPL D-15133
- "Cassini/Huygens Program Archive Plan for Science Data", Version 1, August 3, 2000, JPL D-15976, PD 699-068.

1.4 Configuration Management

This document is controlled by Cassini configuration management. Changes to the scope of this document must be requested via the Cassini project Engineering Change Request (ECR) process. Under this process, ECRs are impacted by the IO ISS/VIMS Manager and the ISS Team Lead, and approved by Project management.

2. SOURCE

The image data files described herein are constructed by the IO ISS operations software from raw telemetry packets extracted from the Telemetry Delivery Subsystem (TDS). The images have not been radiometrically or geometrically corrected.

3. FILE NAMING

The image data file associated with any given PDS label file contains identical information in the filename, with the exception of the "lbl" portion.

3.1 Detached PDS Label File

The filename of the detached label is:

Innnnnn_v.lbl where

I is an instrument identifier ('N' or 'W'),

nnnnnn is the numeric value of the spacecraft clock at the time of shutter close,

v is the version number of the label file, and

lbl is the literal string "LBL".

Example: W1832898283_4.LBL

NOTE: In some cases, a preliminary product may be generated without all the corresponding predicted information (due to a mismatch of parameters or incomplete information.) Once the parameter mismatch is resolved, and predicted information is updated in the IO/MIPL database if needed, a final version of the label will be generated following the file naming convention described above. During the interim, the preliminary label will be uniquely identified as follows:

Innnnnn.DOY-HHMMSS.lbl where

I is an instrument identifier ('N' or 'W'),

nnnnnn is the numeric value of the spacecraft clock at the time of shutter close,

DOY is the day of year the label was created,

HH is the hour, MM is the minutes and SS is the seconds portion of the time the label was created, and

lbl is the literal string "LBL".

Example: W1832898283.294-133021.LBL

3.2 Image Data File

The external filename of the image data file will consist of a string which incorporates information about the instrument name, the spacecraft clock and version. The instrument name is required because the spacecraft clock will not be unique for simultaneous exposures. The version is required because the same image may be built multiple times due to multiple downlinks, or multiple TDS queries, etc. The following format will be followed:

Innnnn_v.img, where

I is an instrument identifier ('N' or 'W')

nnnnn is the numeric value of the spacecraft clock at the time of shutter close

v is the version number of the file, and

img is the literal string “IMG”.

Example: W1832898283_4.IMG

NOTE: In some cases, a preliminary product may be generated without all the corresponding predicted information (due to a mismatch of parameters or incomplete information.) Once the parameter mismatch is resolved, and predicted information is updated in the IO/MIPL database if needed, a final version of the product will be generated following the file naming convention described above. During the interim, the preliminary product will be uniquely identified as follows:

Innnnnn.DOY-HHMMSS where

I is an instrument identifier ('N' or 'W'),

nnnnnn is the numeric value of the spacecraft clock at the time of shutter close,

DOY is the day of year the product was created,

HH is the hour, MM is the minutes and SS is the seconds portion of the time the product was created.

Example: W1832898283.294-133021

4. STRUCTURE CONVENTIONS

All data will be written in the IO platform's native data representation style. The current platform is a Sun workstation, which makes the representation Most Significant Byte first (MSB) or "big endian". The ordering of bits and bytes is only significant for pixel data; all other labeling information is in ASCII. This ordering follows both the PDS and VICAR file format conventions. For PDS, the SAMPLE_TYPE label in the IMAGE object defines which ordering is used in the file. For VICAR, the INTFMT and REALFMT labels in the System label define the ordering. Both file formats specify that bit 0 is the least significant bit of a byte.

5. SOURCE OF DATA VALUES

Each Image data file contains both pixel data and accompanying label and header data values, and is constructed from Cassini Science Packets..In Sections 6 and 7, keywords and values are described for the PDS and Image Data file label items. In these sections, the following notation is used to indicate the source of label items:

"TLM" means the label item is returned via telemetry (either housekeeping or science data).

"Packet" means the item came from the Cassini Secondary Packet header of the ISS science packets.

"SH" means the label item came from the Standard ISS Science Header.

"XH" means the label item came from the Extended ISS Science Header.

"SFDU Header" means the label item came from the SFDU Header.

"MIPL" or "MIPL catalog" mean the label item was derived during telemetry processing at the Multimission Image Processing Laboratory.

"PDS" means the label item was pre-designated by the PDS and remains fixed for the entire dataset.

"TL via IOI file and MIPL catalog" means the label item was specified by the Team Lead in the Instrument Operations Interface (IOI) file and migrated to the product label through the MIPL catalog. The specific catalog table and field names are noted: tableName.fieldName.

"PEF via MIPL catalog" means the label item was extracted from the Predicted Events File during the uplink process and migrated to the product label through the MIPL catalog. The specific catalog table and field names are noted: tableName.fieldName.

6. PDS LABEL INTERFACE SPECIFICATIONS

6.1 Introduction

Corresponding to each Image Data file is a detached ASCII PDS label file which is included in order to make the products PDS compliant. The following three sections describe the PDS label in further detail. Section 6.2 describes the file characteristics and pointers to structures within the Image Data file. Section 6.3 describes the PDS label keywords which map exactly to keywords in the asscociated Image Data file. Section 6.4 describes pointers and further detail on objects within the Image Data File.

6.2 PDS File Characteristics and Pointers to Objects

This section describes keywords required by PDS and pertains to overall file characteristics. It also describes pointers to structures in the associated Image Data File.

TABLE 6.2 – PDS FILE CHARACTERISTICS AND POINTERS TO OBJECTS

PDS/VICAR Label Keyword	*Description*	*Type*	*Valid Values*	*Source*
PDS_VERSION_ID	The PDS standard being used.	STRING	PDS3	PDS
RECORD_TYPE	Style of records used in this data file.	STRING	FIXED_LENGTH	MIPL
RECORD_BYTES	Number of bytes per record in this data file.	INTEGER	280, 536, 1048 or 2072	MIPL
FILE_RECORDS	Number of records in this data file.	INTEGER		MIPL
^IMAGE_HEADER	Pointer to file and record where Image Header starts.	(STRING, INTEGER)	Example: ("N12345678_1.IMG",1)	MIPL
^TELEMETRY_TABLE	Pointer to file and record where Telemetry Header starts.	(STRING, INTEGER)	Example: ("N12345678_1.IMG",3)	MIPL
^LINE_PREFIX_TABLE	Pointer to file and record where Line Prefix data starts.	(STRING, INTEGER)	Example: ("N12345678_1.IMG",4)	MIPL
^IMAGE	Pointer to file and record where Image Pixel data starts.	(STRING, INTEGER)	Example: ("N12345678_1.IMG",4)	MIPL

6.3 PDS Label Keywords

This section describes the PDS detached label keywords and values. These keywords are identical to their counterparts of the same name in the Image Data File VICAR Property labels (see Section 7.2.3).

TABLE 6.3 PDS LABEL KEYWORDS

Keyword	*Description*	*Type*	*Valid Values*	*Source*
ANTIBLOOMING_STATE_FLAG	Indicator of whether antiblooming was used for this image.	STRING	"ON" "OFF" "UNK" if extended header is unavailable and database predict can't be found.	TLM – XH bit 104 or MIPL catalog: (issParamTour.antiBloomingStateFlag)
BIAS_STRIP_MEAN	Mean value of the overclocked pixel values from all lines except the first and last. Not affected by light or dark current. . Before C32, when FLIGHT_SOFTWARE_VERSION = 1.2, this uses one overclocked pixel value per line. This value should be ignored for LOSSY compressed data as it does not contain valid data. During C32 (beginning at SCLK_START_COUNT_SECONDS = 1401927444), when FLIGHT_SOFTWARE_VERSION = 1.3, this uses six overclocked pixel values per line. This value should be ignored for LOSSY compressed data as it does not contain valid data. When FLIGHT_SOFTWARE_VERSION = 1.4, for Lossy compressed data, this value is the mean of the overclocked pixel sum returned in the last	REAL		MIPL – calculated from LH bytes 7 & 8, averaged over entire image.

	compression block of the image.			
CALIBRATION_LAMP _STATE_FLAG	Indicator of whether calibration lamp was used for this image. (ISSNA has none, so it's always "N/A")	STRING	"ON" "OFF" "N/A" "UNK" if extended header is unavailable and database predict can't be found.	TLM – XH bit 99 or MIPL catalog: (issParamTour. comandedCalLamp StateFlag)

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
COMMAND_FILE_NAME	The name of the IOI file containing the observation description for this product - sent from the ISS Team Lead to IO. (Formerly known as SOURCE_FILE _NAME)	STRING		TL via IOI file and MIPL catalog: (issParam HeaderTour. command FileName)
COMMAND_SEQUENCE _NUMBER	Numeric identifier for a sequence of commands sent to the spacecraft. Also known as "trigger number". (Comes from the TRIGGER_NUMBER keyword in the IOI file.)	INTEGER	Valid range: 1 to 65535 Note that 1-12 are reserved for IO use and 8 is reserved for OpNav.	TL via IOI file and MIPL catalog: (issPredTour. commandSequenceNu mber)
DARK_STRIP_MEAN	Mean value of the extended pixel values from all lines except the first and last. Not affected by light, but by dark current and Dark Band problem. For FLIGHT_SOFTWARE_VERSION_ID=1.2 or 1.3, this value should be ignored for LOSSY compressed data as it does not contain valid data. When the FLIGHT_SOFTWARE_VERSION_ID = "1.4" , for Lossy compressed data this value is the mean of the extended pixel sum returned in the last compression block for the image.	REAL		MIPL – calculated from LH bytes 5 & 6, averaged over entire image.
DATA_CONVERSION_ TYPE	The method of conversion used to convert image from 12 to 8 bits selected for this image.	STRING	"12BIT" = no conversion "TABLE" = conversion by look-up table "8LSB" = keep only the 8 least significant bits	TLM – SH bits 6 & 7

DATA_SET_ID	PDS-supplied name for this dataset.	STRING	"CO-J-ISSNA/ISSWA-2-EDR-V1.0" before Approach Science begins. "CO-S-ISSNA/ISSWA-2-EDR-V1.0" after Approach Science begins.	PDS

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
DELAYED_READOUT _FLAG	Indicator of whether the image may have waited on the CCD while the other camera was performing a readout.	STRING	"YES","NO" "UNK" if extended header is unavailable and database predict can't be found.	TLM –from SH bit 0 (camera id), EX bit 439 (both) and XH bit 405 (order) or MIPL catalog: (issParamTour.readOut Order)
DESCRIPTION	Descriptive comment up to 255 characters. Populated by IO telemetry processing, validation and reconciliation software to describe known limitations of this product.	STRING	"N/A" when not available	MIPL
DETECTOR _TEMPERATURE	The temperature of the CCD.	REAL (degrees C) <DEG C>	-999.0 if extended header is unavailable.	TLM – XH bits 208-224
EARTH_RECEIVED_ START_TIME	Earth Received time of the earliest record containing valid data for this image (UTC). ASCII CCSDS format: yyyy-dddThh:mm:ss.fffZ (T is a delimitter between date and time).	DATE		TLM – earliest SFDU header used in generating image
EARTH_RECEIVED_ STOP_TIME	Earth Received time of the latest record containing valid data for this image (UTC). ASCII CCSDS format: yyyy-dddThh:mm:ss.fffZ	DATE		TLM – latest SFDU header used in generating image
ELECTRONICS_BIAS	Commanded electronics bias to ensure that all DN values are greater than zero. (Comes from the	INTEGER	0-255	TL via IOI file and MIPL catalog

	VIDEO_OFFSET keyword in the IOI file.)			(issParam Tour. electronicsBias)

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
EXPECTED_MAXIMUM	A two valued array describing the expected value of the maximum data element expressed as a percentage of the VALID_MAXIMUM. The first element of the array pertains to the full well component. This represents the ratio of the expected maximum DN in the image to the VALID_MAXIMUM (full well DN). (Comes from the EXPECTED_MAXIMUM_PERCENT_FULL_WELL keyword in the IOI file.) The second element of the array indicates the maximum DN component. This represents the ratio of the expected maximum DN in the image to the VALID_MAXIMUM (maxDN). (Comes from the EXPECTED_MAXIMUM_PERCENT_MAX_DN keyword in the IOI file.)	(REAL, REAL)	Valid range: >0	TL via IOI file and MIPL catalog (issParamTour.expectedMaxPercentFullWell, issParamTour.expectedMaxPercentMaxDN
EXPECTED_PACKETS	This keyword provides the total number of packets expected to be stored on the SSR for this image. To convert to volume in bits, multiply this value by 7616 bits/packet. (Comes from the EXPECTED_PACKETS keyword in the IOI file.)	INTEGER	1 - 2277	TL via IOI file and MIPL catalog (issParamTour. expectedPackets)
EXPOSURE_DURATION	The exposure duration for the image.	REAL (milli-seconds)	63 distinct values from 0 to 1200000. (See table in AppendixA.) -999.0 if extended header is unavailable and database predict	TLM – XH 8 bit index starting at bit 408 or MIPL catalog: (issParamTour. exposureDuration)

			can’t be found.	

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
FILTER_NAME	A two valued array naming the optical filters used for this image. The first value pertains to Filter Wheel 1, the second value pertains to Filter Wheel 2.	(STRING, STRING)	The format is (Filter1, Filter2) (See Appendix A, Table 8.2.)	TLM – SH 4 bit index: Filter 1 starts at bit 13, Filter 2 starts at bit 17.
FILTER_TEMPERATURE	Temperature of the filter wheels.	REAL (degrees C)	-999.0 if housekeeping is unavailable.	TLM – Housekeeping channels: NAC s-0502, WAC s-0506
FLIGHT_SOFTWARE_ VERSION_ID	Indicates version of instrument flight software used to acquire image.	STRING		MIPL via catalog (fswVersions.fsw VersionId)
GAIN_MODE_ID	The electronics gain setting selected for this image, given in units of electrons per DN. (This is an approximate value so both cameras can use the same set of values.)	STRING	"12 ELECTRONS PER DN", "29 ELECTRONS PER DN", "95 ELECTRONS PER DN", "215 ELECTRONS PER DN"	TLM – SH bits 11 & 12

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
IMAGE__MID_TIME	Exposure mid-time calculated from spacecraft clock using both the coarse (seconds) and fine (subRTI) counters (UTC). (A subRTI is approximately 4 msec (1/256 second)). This value is calculated from the SPACECRAFT_CLOCK_ STOP_COUNT – (EXPOSURE_DURATION/2) then converted to UTC. When the shutter was inhibited (ie SHUTTER_STATE_ID="DISABLED"), the IMAGE_MID_TIME = START_TIME = STOP_TIME, and all three represent the start of the exposure window during the prepare cycle of the image. ASCII CCSDS format: yyyy-dddThh:mm:ss.fffZ	DATE	Example: 1996-158T05:53:34.000Z	TLM – packet header
IMAGE_NUMBER	The seconds portion of the spacecraft clock at shutter close.	STRING (seconds)		TLM – packet header
IMAGE_OBSERVATION_TYPE	A multi-valued list describing the purpose(s) of this image, for example, OPNAV, science, calibration, engineering and/or support imaging. (Comes from the IMAGE_OBSERVATION_TYPE_* keywords in the IOI file parameter set description.) This list can contain up to five values where the purposes of the image are identified. More than one value may be specified. The list is comma delimited enclosed in curly braces.	STRING, STRING, STRING, STRING, STRING	{"CALIBRATION", "ENGINEERING", "OPNAV", "SCIENCE", "SUPPORT"}	TL via IOI file and MIPL catalog: (issParam Tour.imageObsType*)

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
IMAGE_TIME	Time of shutter close calculated from spacecraft clock using both the coarse (seconds) and fine (subRTI) counters (UTC). (A subRTI is approximately 4 msec (1/256 second)). When the shutter was inhibited (ie SHUTTER_STATE_ID="DISABLED"), the IMAGE_TIME = START_TIME = STOP_TIME, and all three represent the start of the exposure window during the prepare cycle of the image. ASCII CCSDS format: yyyy-dddThh:mm:ss.fffZ	DATE	Example: 1996-158T05:53:34.000Z	TLM – packet header
INSTRUMENT_DATA_RATE	The rate at which data was transferred out of instrument.	REAL (kilobits/second)	60.9, 121.9, 182.8, 243.7, 304.6, 365.6 -999.0 if channelized data and extended header are unavailable.	TLM – channels C-2034 and C-2060, else TLM – XH 4 bits, starting at bit 112
INSTRUMENT_HOST_NAME	Name of the spacecraft upon which this instrument resides.	STRING	"CASSINI ORBITER"	PDS
INSTRUMENT_ID	Indicator of which camera took this image.	STRING	"ISSNA", "ISSWA"	TLM – SH bit 0
INSTRUMENT_MODE_ID	The summation mode used for this image.	STRING	"FULL","SUM2","SUM4"	TLM – SH bit 1 & 2 (See Table 8.5 in Appendix A.)

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
INSTRUMENT_NAME	Name of the CASSINI Instrument which acquired the image data.	STRING	"IMAGING SCIENCE SUBSYSTEM NARROW ANGLE", "IMAGING SCIENCE SUBSYSTEM WIDE ANGLE"	TLM – SH bit 0
INST_CMPRS_PARAM	A four valued array describing lossy compression. (Applies only when INST_CMPRS_TYPE = "LOSSY"). The first value defines the MALGO (algorithm) parameter , the second value defines the TB (block type) parameter, the third value defines the group-of-blocks (number of blocks per group) parameter, and the fourth defines the compression rate parameter (quantiztion factor).	(INT, INT, INT, INT)	((0, 1); (0,1); (1-255)*; (0-15)) ("N/A","N/A","N/A","N/A") for not LOSSY compressed data. *To calculate integer value of GOB, multiply value from SH by 2 and add 1.	TLM – SH: Malgo – bit 46 TB – bit 47 GOB – bits 35-41 Compression rate – bits 42-45
INST_CMPRS_RATE	A two valued array providing the average number of bits needed to represent a pixel. The first value of the array represents the expected average number of bits and comes from the BITS_PER_PIXEL keyword in the IOI file. The second value represents the actual average number of bits and is calculated during telemetry processing.	(REAL, REAL) (bits/pixel)	Valid range: >0.0 to 16.0	TL via IOI file and MIPL catalog, MIPL: (issParamTour.bitsPerPixel, issProdTour.instCmprsRate)
INST_CMPRS_RATIO	Ratio of expected image size to size of image received. (Calculation of this value does not include	REAL	"N/A" for uncompressed data	MIPL

	data outages due to truncated readouts or data lost in transmission.)			

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
INST_CMPRS_TYPE	Compression type used for the image	STRING	"NOTCOMP" (not compressed) "LOSSLESS" (aka RICE) "LOSSY" (aka Discrete Cosine Transform)	TLM – SH bits 3 & 4
LIGHT_FLOOD_STATE_FLAG	Indicator of whether Light Flood was used just prior to taking this image.	STRING	"ON", "OFF" "UNK" if extended header is unavailable and database predict can't be found.	TLM – XH bit 50 or MIPL catalog: (issParamTour.lightFloodStateFlag)
METHOD_DESC	This keyword describes the information and/or algorithm used to calculate the I/F value used by the ISS team to determine the EXPOSURE_DURATION. (Limited to char(75)). (Comes from the METHOD_DESC keyword in the IOI file.)	STRING		TL via IOI file and MIPL catalog (issParamTour.methodDesc)
MISSING_LINES	For non-lossy compressed data only, number of missing or incomplete image lines. For all data, including lossy compressed images, when data is missing, the missing pixel values are replaced by 0.	INTEGER	"N/A" for lossy compressed data.	MIPL

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
MISSING_PACKET_ FLAG	Indicator of whether consecutive packets were received. If set to "YES", this flag indicates that packets needed to construct a complete image were missing. If set to "NO", all consecutive packets were received. However, data may be missing at the beginning or end of the image. In this case, missing data would be reflected in the MISSING_LINES keyword for non-lossy data, and through visual inspection for lossy compressed data.	STRING	"YES", "NO"	MIPL
MISSION_NAME	Mission name associated with this image.	STRING	"CASSINI-HUYGENS "	PDS
MISSION_PHASE_NAME	Mission phase of which this image is a part.	STRING	"SATURN ORBIT INSERTION", "SCIENCE_CRUISE", "SPACE_SCIENCE", "APPROACH_SCIENCE", "TOUR PRE-HUYGENS", "PHOEBE ENCOUNTER", "TITAN A ENCOUNTER", "TITAN B ENCOUNTER", "HUYGENS DESCENT", "HUYGENS PROBE SEPARATION",	MIPL catalog (missionPhases.missionPhaseName)

			"TITAN C HUYGENS", "TOUR"	

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
OBSERVATION_ID	Name of observation of which this image is a part. NOTE: The basic source of this value is the Request Name (up to any "$" delimiter) from Predicted Events File (PEF). There are no checks performed by IO/MIPL to ensure that values for this keyword conform to PDS standards.	STRING		PEF via MIPL catalog (issPredTour. observationId)
OPTICS_TEMPERATURE	A two valued array describing optics temperature. The first element of the array pertains to the front optics temperature, and the second element pertains to the rear optics. Note that there is no rear optics temperature for the WAC camera, so when INSTRUMENT_ID = ISSWA, the second element of the array will always be –999.0.	(REAL, REAL) (degrees C)	(-999.0, -999.0) if the extended header is unavailable.	TLM – XH bits 224 – 240
ORDER_NUMBER	Identifier provided by Team Lead for this image which is unique within the IOI file. This value will not be unique for parameter sets described in the IOI file with ITERATION_COUNT > 1 or with LOOP_COUNT > 1.	INTEGER	>=0.	TL via IOI file and MIPL catalog. (issParamTour.order Number)
PARALLEL_CLOCK_ VOLTAGE_INDEX	Commanded parallel clock voltage index. Controls clocking frequency. (Comes from the PC_VOLTAGE keyword in the IOI file.)	INTEGER	0-15	TL via IOI file and MIPL catalog (issParamTour. parallelClock VoltageIndex)

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
PREPARE_CYCLE _INDEX	The element number within the Prepare Cycle table selected for this image.	INTEGER	0 – 15 (See table in AppendixA.) "UNK" if extended header is unavailable and database predict can't be found.	TLM – XH bits 57 – 60 or MIPL catalog: (issParamTour.prepare CycleIndex)
PRODUCT_CREATION_ TIME	Time of creation of this image on the ground (Pacific local time). ASCII CCSDS format: yyyy-dddThh:mm:ss.fffZ	DATE	Example: 1996-158T05:53:34.000Z	MIPL
PRODUCT_ID	Unique identifier for each image commanded. Required by PDS. The PRODUCT_ID will be constructed: SPACECRAFT_CLOCK_ CNT_PARTITION"_"ISPACECRAFT_CLOCK_ STOP_COUNT, where I is "N" if the INSTRUMENT_ID is "ISSNA", and I is "W" if the INSTRUMENT_ID is "ISSWA".	STRING	Example: "1_N832898284.123"	MIPL
PRODUCT_VERSION_ TYPE	Identifies the version of an individual data product. Always "FINAL" for products archived with PDS. "PRELIMINARY" indicates additional processing is underway at IO/MIPL, for instance, to recover additional telemetry if possible.	STRING	"PRELIMINARY", "FINAL"	MIPL

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
READOUT_CYCLE _INDEX	The element number within the Readout Cycle table selected for this image.	INTEGER	0 – 15 (See table in AppendixA.) "UNK" if extended header is unavailable and database predict can't be found.	TLM – XH bits 61 – 64 or MIPL catalog: (issParamTour. read OutCycleIndex)
RECEIVED_PACKETS	This keyword provides the actual number of packets received from the SSR for this image. To convert to volume in bits, multiply this value by 7616 bits/packet. This value reflects data received. In the event the image is incomplete due to an outage in the transmission, this field will not be an accurate indicator of actual volume on the SSR.	INTEGER	1 – 2277	MIPL
SENSOR_HEAD_ELEC _TEMPERATURE	Temperature of the sensor head electronics.	REAL (degrees C)	-999.0 if housekeeping is unavailable.	TLM – Housekeeping channels: NAC s-0503, WAC s-0507
SEQUENCE_ID	Identifies the segment associated with this image. Note that this keyword does not come from the IOI file.	STRING	Example: "C22"	MIPL catalog: (issPredTour. sequenctId)

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
SEQUENCE_NUMBER	Indicates the order in which this image was expected to be taken within the given observation (OBSERVATION_ID). Note: In the event that images are missing, values for this keyword will not be sequential. This value is not unique outside the given observation.	INTEGER		Calculated by MIPL based on PEF and IOI file. Stored in MIPL catalog: (issPredTour.sequence Number)
SEQUENCE_TITLE	The name assigned by the Team Lead for the activity of which this image is a part. Comes from the SEQUENCE_TITLE keyword in the IOI file. Limited to 30 characters.	STRING	This value is defaulted to "N/A".	TL via IOI file and MIPL catalog: (issParamHeaderTour.s equenceTitle)
SHUTTER_MODE_ID	Indicator of whether this exposure was part of a joint observation with the other ISS camera.	STRING	"BOTSIM","NACONL Y", "WACONLY","UNK" "UNK" if extended header is unavailable and database predict can't be found.	TLM – Calculated from XH bit 439 (both) and SH bit 0 (camera) or MIPL catalog: (issParamTour.shutter ModeId)
SHUTTER_STATE_ID	Indicator of whether the shutter was enabled during the exposure.	STRING	"ENABLED", "DISABLED" "UNK" if extended header is unavailable and database predict	TLM – XH bit 407 or MIPL catalog: (issParamTour.shutter StateId)

			can’t be found.	

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
SOFTWARE_VERSION_ID	Ground software version used to generate this image.	STRING		MIPL
SPACECRAFT_CLOCK_ CNT_PARTITION	Indicates the clock partition active for the SPACECRAFT_CLOCK_START_ COUNT and SPACECRAFT_CLOCK STOP_COUNT elements. Remains at "1" unless the spacecraft clock rolls over or is reset.	INTEGER	>=1	MIPL catalog (issPredTour. sclkCntPartition)
SPACECRAFT_CLOCK_ START_COUNT	The seconds and subRTI portions of the spacecraft clock at shutter open. Calculated from spacecraft clock of shutter close less the exposure duration. When the shutter was inhibited (ie SHUTTER_STATE_ID="DISABLED"), the SPACECRAFT_CLOCK_START_COUNT = SPACECRAFT_CLOCK_STOP_COUNT, and both represent the start of the exposure window during the prepare cycle of the image. Format: seconds.subRTIs	STRING	Example: "832898283.123"	TLM – Calculated from SPACECRAFT_CLOC K_ STOP_COUNT and EXPOSURE_ DURATION

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
SPACECRAFT_CLOCK_ STOP_COUNT	The seconds and subRTI portions of the spacecraft clock at shutter close. (A subRTI is approximately 4 msec (1/256 second)). When the shutter was inhibited (ie SHUTTER_STATE_ID="DISABLED"), the SPACECRAFT_CLOCK_START_COUNT = SPACECRAFT_CLOCK_STOP_COUNT, and both represent the start of the exposure window during the prepare cycle of the image. Format: seconds.subRTIs	STRING	Example: "832898284.456"	TLM – packet header
START_TIME	Time of shutter open. Calculated from spacecraft clock of shutter close less the exposure duration. Expressed in UTC format, and includes subRTI resolution. (A subRTI is approximately 4 msec (1/256 second)). When the shutter was inhibited (ie SHUTTER_STATE_ID="DISABLED"), the START_TIME = STOP_TIME, and both represent the start of the exposure window during the prepare cycle of the image.	DATE	Example: 1996-158T05:53:34.000Z	TLM – Calculated from SPACECRAFT_ CLOCK_ STOP_COUNT and EXPOSURE_ DURATION
STOP_TIME	Time of shutter close from spacecraft clock (UTC). Identical to IMAGE_TIME. Includes subRTI resolution. (A subRTI is approximately 4 msec (1/256 second)). When the shutter was inhibited (ie SHUTTER_STATE_ID="DISABLED"), the START_TIME = STOP_TIME, and both represent	DATE	Example: 1996-158T05:53:34.000Z	TLM – packet header

	the start of the exposure window during the prepare cycle of the image.			

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
TARGET_DESC	The name of the intended target for which the exposure was calculated/selected in the given image. May include calibration type information. Limited to 75 characters. (Comes from the TARGET_DESC keyword in the IOI file.)	STRING		TL via IOI file and MIPL catalog (issParamTour.target Desc)
TARGET_LIST	List of all Saturnian system bodies within the field of view. Note: This information is derived from star tracking data and the spacecraft and planetary body ephemerides, and is limited to the accuracy of that set of data.	STRING	"N/A" for all products generated by IO/MIPL.	MIPL initially, then updated by TL for archive.
TARGET_NAME	Name of the target being imaged. NOTE: For Cassini ISS, the basic source of this value is the Predicted Events File (PEF) which contains the targeting SCART. There are no checks performed by IO/MIPL to ensure that values for this keyword also appear in the PDS Data Dictionary. Also, this value may not be correct for retargetables.	STRING		PEF via MIPL catalog (issPredTour. scartTarget Name)

TELEMETRY_FORMAT_ ID	The telemetry mode in effect when sending data from the instrument to the spacecraft computer.	STRING	"S_N_ER_1", "S_N_ER_2", "S_N_ER_3", "S_N_ER_4", "S_N_ER_5", "S_N_ER_5A", "S_N_ER_6", "SAF_142200" "UNK" if channelized engineering data is not available.	TLM – channels C-2034 and C-2060.

TABLE 6.3 PDS LABEL KEYWORDS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
VALID_MAXIMUM	The VALID_MAXIMUM data element represents the maximum value that is valid for a data object. For Cassini ISS, this keyword is a two valued array. The first element of the array indicates the minimum full well saturation level of the instrument, which is a function of INSTRUMENT_MODE_ID, INSTRUMENT_ID, and GAIN_MODE_ID, expressed as a DN value. This may exceed 4095. The second element of the array indicates the maximum DN saturation level for the signal returned by the A/D converter. Valid values are 255 and 4095.	(INTEGER, INTEGER)	(See Appendix A, Table 8.5 for full well saturation values, 255 or 4095 for maximum DN) Note: In the event that a combination of instrument mode, instrument ID and gain does not appear in Appendix A, Table 8.5, -999 will be used for the first element of this array.	MIPL

6.4 PDS Objects

This section describes keywords required by PDS and pertains to the structure of objects in the associated Image Data File.

TABLE 6.4 PDS OBJECTS

Keyword	*Description*	*Type*	*Valid Values*	*Source*
OBJECT	Name of Object for which the description starts here.	STRING	IMAGE_HEADER	MIPL
INTERCHANGE_ FORMAT	Format of the data in this object.	STRING	ASCII	MIPL
HEADER_TYPE	Name of the style of ASCII header preceding the data of this object.	STRING	VICAR2	MIPL
BYTES	Number of bytes per record of this object . (Same as RECORD_BYTES).	INTEGER		MIPL
RECORDS	Number of records in the IMAGE_HEADER object.	INTEGER		MIPL
^DESCRIPTION	Pointer to the file which contains the description of this object .	STRING	"VICAR2.TXT"	MIPL
END_OBJECT	Name of Object for which the description ends here.	STRING	IMAGE_HEADER	MIPL
OBJECT	Name of Object for which the description starts here.	STRING	TELEMETRY_TABLE	MIPL
INTERCHANGE_ FORMAT	Format of the data in this object.	STRING	BINARY	MIPL
ROWS	Number of rows of data in this object.	INTEGER	1	MIPL
COLUMNS	Number of columns of data in this object .	INTEGER	2	MIPL

TABLE 6.4 PDS OBJECTS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
ROW_BYTES	Number of bytes per row. (Same as RECORD_BYTES).	INTEGER		MIPL
^STRUCTURE	Pointer to the file which contains the record format description.	STRING	"TLMTAB.FMT"	MIPL
OBJECT	Name of Object for which the description ends here.	STRING	COLUMN	MIPL
NAME	Name of Object for which the description starts here.	STRING	NULL_PADDING	MIPL
DATA_TYPE	Data type of the data in this object.	STRING	MSB_UNSIGNED_INTEGER	MIPL
START_BYTE	Location in the record of the starting byte of this object.	INTEGER	61	MIPL
BYTES	Number of bytes in this object. (Same as ROW_BYTES minus 61).	INTEGER		MIPL
END_OBJECT	Name of Object for which the description ends here.	STRING	COLUMN	MIPL
END_OBJECT	Name of Object for which the description ends here.	STRING	TELEMETRY_TABLE	MIPL
OBJECT	Name of Object for which the description starts here.	STRING	LINE_PREFIX_TABLE	MIPL
INTERCHANGE_FORMAT	Format of the data in this object.	STRING	BINARY	MIPL

TABLE 6.4 PDS OBJECTS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
ROWS	Number of rows of data in this object.	INTEGER	256 (SUM4), 512 (SUM2) or 1024 (FULL)	MIPL
COLUMNS	Number of columns of data in this object .	INTEGER	7	MIPL
ROW_BYTES	Number of bytes per row.	INTEGER	24	MIPL
ROW_SUFFIX_BYTES	Number of bytes in the suffix region (ie image data) of each row of this object .	INTEGER	256 (SUM4, 8 bit), 512 (SUM2, 8bit or SUM4, 16 bit), 1024 (FULL, 8bit or SUM2, 16 bit) or 2048 (FULL, 16 bit)	MIPL
^LINE_PREFIX _STRUCTURE	Pointer to the file which contains the record format description.	STRING	"PREFIX3.FMT"	MIPL
END_OBJECT	Name of Object for which the description ends here.	STRING	LINE_PREFIX_TABLE	MIPL
OBJECT	Name of Object for which the description starts here.	STRING	IMAGE	MIPL
LINES	Number of lines of data in this object.	INTEGER	256 (SUM4), 512 (SUM2) or 1024 (FULL)	MIPL
LINE_SAMPLES	Number of samples per line of this object .	INTEGER	256 (SUM4), 512 (SUM2) or 1024 (FULL)	MIPL

TABLE 6.4 PDS OBJECTS (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
SAMPLE_BITS	Number of bits in each sample of this object .	INTEGER	8 or 16	MIPL
SAMPLE_TYPE	Data representation type for the samples of this object.	STRING	SUN_INTEGER	MIPL
LINE_PREFIX_BYTES	Number of bytes in the prefix region of each record of this object .	INTEGER	24	MIPL
END_OBJECT	Name of Object for which the description ends here.	STRING	IMAGE	MIPL
END		STRING		MIPL

7. IMAGE DATA FILE INTERFACE SPECIFICATIONS

7.1 Image Data File Structure

Each image data file contains fixed length records and consists of the the following items which will be described in the subsequent sections in more detail. See Figure 7.1 for a graphic representation of the image data file structure:

- ASCII VICAR Label which is included to facilitate image processing and allow easy validation of products using existing VICAR software. This item is described in further detail in Section 7.2.
- Binary Label Header (also known as the Binary Telemetry Header) contains information about the image as a whole and is populated directly from the telemetry available for the product. This item is described in further detail in Section 7.3.
- Image Line Records whichare comprised of 24 bytes of Binary Line Prefix plus pixel data. This item is described in further detail in Section 7.4.
- An optional End-of-Dataset Label (EOL). Inherent to the VICAR label is the possibility of an ASCII EOL label being appended after the binary data in order to handle label modifications. This item is described in further detail in Section 7.2.

FIGURE 7.1 IMAGE DATA FILE STRUCTURE

7.2 VICAR Label Description

7.2.1 Introduction

The VICAR Label is a set of ASCII "keyword=value" sets of information describing the important characteristics of the image. The Label is designed to be human-readable because it often is used to annotate products derived from the image, such as prints or plots. In addition, it is maintained through the various processed versions of the image to allow traceability with the original data. Also, the Label items may be extracted by software modules in order to guide automated processing procedures.

The VICAR Label contains required System items (such as image size information) and History items (recording processing history for the file), and optional Property items (such as items describing gain states, etc.). A detailed definition of the structure of VICAR labels is found in the *VICAR File Format* (see References).

7.2.2 System Label Items

The System portion of the VICAR Label describes to humans or software the format, size and other structural characteristics of the image data file. Table 7.2.2 defines the keywords and values of these VICAR-required items. See the *VICAR File Format* for more detail.

TABLE 7.2.2 SYSTEM LABEL

Keyword	*Type*	*Description*	*Valid Values*
LBLSIZE	INTEGER	Number of bytes in the VICAR label. A multiple of RECSIZE as necessary to contain all VICAR label items.	At a minimum, 280. Multiple of RECSIZE.
FORMAT	STRING	Data representation format	'HALF' (16-bit data) 'BYTE' (8-bit data)
TYPE	STRING	Kind of data represented by this file	'IMAGE'
BUFSIZ	INTEGER	Internal blocksize VICAR will use during I/O. Same as RECSIZE.	280 – 2072 (see RECSIZE)
DIM	INTEGER	Number of potential dimensions in the file	3
EOL	INTEGER	A flag indicating the end-of-dataset . If flag is set to 1, then VICAR label data exists after the image data portion of the file.	1 if EOL exists, otherwise 0
RECSIZE	INTEGER	Number of bytes in each record. This includes 24 bytes of binary prefix per record, plus image data.	2072 (for Full Res, 16-bit) 1048 (for 2x2 summation, 16-bit) 536 (for 4x4 summation, 16-bit) 1048 (for Full Res, 8-bit) 536 (for 2x2 summation, 8-bit) 280 (for 4x4 summation, 8-bit)
ORG	STRING	Organization of the data bands	'BSQ' (band-sequential data)
NL	INTEGER	Number of lines per band	1024 (for Full Res) 512 (for 2x2 summation) 256 (for 4x4 summation)
NS	INTEGER	Number of image samples per line	1024 (for Full Res) 512 (for 2x2 summation) 256 (for 4x4 summation)

NB	INTEGER	Number of bands	1

TABLE 7.2.2 SYSTEM LABEL (CONTINUED)

Keyword	*Type*	*Description*	*Valid Values*
N2	INTEGER	Same as NS	1024 (for Full Res) 512 (for 2x2 summation) 256 (for 4x4 summation)
N3	INTEGER	Same as NB	1
N4	INTEGER	Not used	0
NBB	INTEGER	Number of binary prefix bytes- see Section 7.4.2 for more detail.	24
NLB	INTEGER	Number of binary header records – see Section 7.3.2	1
HOST	STRING	Platform that wrote data	'SUN-SOLR' (for Sparcstations)
INTFMT	STRING	Style of representation of integer data	'HIGH' (for MSB or "big endian" platforms)
REALFMT	STRING	Style of representation of real data	'IEEE' (for MSB or "big endian" platforms)
BHOST	STRING	Platform that wrote binary labels	'SUN-SOLR' (for Sparcstations)
BINTFMT	STRING	Style of representation of integer data in the Binary label	'HIGH' (for MSB or "big endian" platforms)
BREALFMT	STRING	Style of representation of real data in the Binary label	'IEEE' (for MSB or "big endian" platforms)
BLTYPE	STRING	Unique name for binary label format	'CAS-ISS2' for FSW 1.2, 'CAS-ISS3' for FSW 1.3, and 'CAS-ISS4' for FSW 1.4

7.2.3 Property Label Items

VICAR Label keywords are grouped into "Property" sets containing similar types of keywords. The Property portions of the VICAR Label contain all of the instrument-specific items necessary for the interpretation of the image data. The VICAR Property labels used to support Cassini ISS are: COMMAND, COMPRESSION, IDENTIFICATION, IMAGE, INSTRUMENT and TELEMETRY. Table 7.2.3.1 through Table 7.2.3.5 define the PDS compliant keywords, values, and data types of these instrument-related items.

TABLE 7.2.3.1 COMMAND PROPERTY LABEL

Keyword	*Description*	*Type*	*Valid Values*	*Source*
COMMAND_FILE_NAME	The name of the IOI file containing the observation description for this product - sent from the ISS Team Lead to IO. (Formerly known as SOURCE_FILE _NAME)	STRING		TL via IOI file and MIPL catalog: (issParamHeaderTour.commandFileName)
COMMAND_SEQUENCE_NUMBER	`Numeric identifier for a sequence of commands sent to the spacecraft. Also known as "trigger number". (Comes from the TRIGGER_NUMBER keyword in the IOI file.)	INTEGER	Valid range: 1 to 65535 Note that 1-12 are reserved for IO use and 8 is reserved for OpNav.	TL via IOI file and MIPL catalog: (issPredTour.commandSequenceNumber)
ELECTRONICS_BIAS	Commanded electronics bias to ensure that all DN values are greater than zero. (Comes from the VIDEO_OFFSET keyword in the IOI file.)	INTEGER	0-255	TL via IOI file and MIPL catalog (issParamTour.electronicsBias)
ORDER_NUMBER	Identifier provided by Team Lead for this image which is unique within the IOI file. This value will not be unique for parameter sets described in the IOI file with ITERATION_COUNT	INTEGER	>=0.	TL via IOI file and MIPL catalog. (issParamTour.orderNumber)

	> 1 or with LOOP_COUNT > 1.			

TABLE 7.2.3.1 COMMAND PROPERTY LABEL(CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
PARALLEL_CLOCK_ VOLTAGE_ INDEX	Commanded parallel clock voltage index. Controls clocking frequency. (Comes from the PC_VOLTAGE keyword in the IOI file.)	INTEGER	0-15	TL via IOI file and MIPL catalog (issParamTour. parallelClock VoltageIndex)

TABLE 7.2.3.2 COMPRESSION PROPERTY LABEL

Keyword	*Description*	*Type*	*Valid Values*	*Source*
EXPECTED_MAXIMUM	A two valued array describing the expected value of the maximum data element expressed as a percentage of the VALID_MAXIMUM. The first element of the array pertains to the full well component. This represents the ratio of the expected maximum DN in the image to the VALID_MAXIMUM (full well DN). (Comes from the EXPECTED_MAXIMUM_PERCENT_FULL_WELL keyword in the IOI file.) The second element of the array indicates the maximum DN component. This represents the ratio of the expected maximum DN in the image to the VALID_MAXIMUM (maxDN). (Comes from the EXPECTED_MAXIMUM_PERCENT_MAX_DN keyword in the IOI file.)	(REAL, REAL)	Valid range: >0	TL via IOI file and MIPL catalog (issParamTour.expecte dMaxPercentFullWell, issParamTour.expected MaxPercentMaxDn

TABLE 7.2.3.2 COMPRESSION PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
INST_CMPRS_PARAM	A four valued array describing lossy compression. (Applies only when INST_CMPRS_TYPE = 'LOSSY'). The first value defines the MALGO (algorithm) parameter , the second value defines the TB (block type) parameter, the third value defines the group-of-blocks (number of blocks per group) parameter, and the fourth defines the compression rate parameter (quantiztion factor).	(INT, INT, INT, INT)	((0, 1); (0,1); (1-255); (0-15)) ('N/A','N/A','N/A','N/A') for not LOSSY compressed data.	TLM – SH: Malgo – bit 46 TB – bit 47 GOB – bits 35-41 Compression rate – bits 43-45
INST_CMPRS_RATE	A two valued array providing the average number of bits needed to represent a pixel. The first value of the array represents the expected average number of bits and comes from the BITS_PER_PIXEL keyword in the IOI file. The second value represents the actual average number of bits and is calculated during telemetry processing.	(REAL, REAL)	Valid range: >0 to 16.0	TL via IOI file and MIPL catalog: (issParamTour.bitsPerPixel, issProdTour.instCmprsRate)
INST_CMPRS_RATIO	Ratio of expected image size to size of image received. (Calculation of this value does not include data outages due to truncated readouts or data lost in transmission.)	REAL	'N/A' for uncompressed data	MIPL
INST_CMPRS_TYPE	Compression type used for the image	STRING	'NOTCOMP' (not compressed) 'LOSSLESS' (aka RICE) 'LOSSY' (aka Discrete Cosine	TLM – SH bits 3 & 4

			Transform)	

TABLE 7.2.3.2 COMPRESSION PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
VALID_MAXIMUM	The VALID_MAXIMUM data element represents the maximum value that is valid for a data object. For Cassini ISS, this keyword is a two valued array. The first element of the array indicates the minimum full well saturation level of the instrument, which is a function of INSTRUMENT_MODE_ID, INSTRUMENT_ID and GAIN_MODE_ID, expressed as a DN value. This may exceed 4095. The second element of the array indicates the maximum DN saturation level for the signal returned by the A/D converter. Valid values are 255 and 4095.	(INTEGER, INTEGER)	(See Appendix A, Table 8.5 for full well saturation values, 255 or 4095)	MIPL

TABLE 7.2.3.3 IDENTIFICATION PROPERTY LABEL

Keyword	*Description*	*Type*	*Valid Values*	*Source*
DATA_SET_ID	PDS-supplied name assigned to the set of data of which this data file is a part.	STRING	'CO-J-ISSNA/ISSWA-2-EDR-V1.0' before Approach Science begins. 'CO-S-ISSNA/ISSWA-2-EDR-V1.0' after	PDS

			Approach Science begins.	

TABLE 7.2.3.3 IDENTIFICATION PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
DESCRIPTION	Descriptive comment up to 255 characters. Populated by IO validation and reconciliation software to describe known limitations of this product.	STRING	'N/A' when not available	MIPL
IMAGE__MID_TIME	Exposure mid-time calculated from spacecraft clock using both the coarse (seconds) and fine (subRTI) counters (UTC). (A subRTI is approximately 4 msec (1/256 second)). This value is calculated from the SPACECRAFT_CLOCK_ STOP_COUNT – (EXPOSURE_DURATION/2) then converted to UTC. When the shutter was inhibited (ie SHUTTER_STATE_ID='DISABLED'), the IMAGE_MID_TIME = START_TIME = STOP_TIME, and all three represent the start of the exposure window during the prepare cycle of the image. ASCII CCSDS format: yyyy-dddThh:mm:ss.fffZ	DATE	Example: 1996-158T05:53:34.000Z	TLM – packet header
IMAGE_NUMBER	The seconds portion of the spacecraft clock at shutter close.	STRING (seconds)		TLM – packet header
IMAGE_OBSERVATION_TYPE	A multi-valued list describing the purpose(s) of this image, for example, OPNAV, science, calibration, engineering and/or support imaging. (Comes from the IMAGE_OBSERVATION_TYPE_* keywords in the IOI file parameter set description.) This list can contain up to five values where the	STRING, STRING, STRING, STRING,	('CALIBRATION', 'ENGINEERING', 'OPNAV', 'SCIENCE',	TL via IOI file and MIPL catalog: (issParam Tour.imageObsType*)

	purposes of the image are identified. More than one value may be specified.	STRING	'SUPPORT')	

TABLE 7.2.3.3 IDENTIFICATION PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
IMAGE_TIME	Shutter close time calculated from spacecraft clock using both the coarse (seconds) and fine (subRTI) counters (UTC). (A subRTI is approximately 4 msec (1/256 second)). When the shutter was inhibited (ie SHUTTER_STATE_ID='DISABLED'), the IMAGE_TIME = START_TIME = STOP_TIME, and all three represent the start of the exposure window during the prepare cycle of the image. ASCII CCSDS format: yyyy-dddThh:mm:ss.fffZ	DATE	Example: 1996-158T05:53:34.000Z	TLM – packet header
INSTRUMENT_HOST_NAME	Name of the spacecraft upon which this instrument resides.	STRING	'CASSINI ORBITER'	PDS
INSTRUMENT_ID	Indicator of which camera took this image.	STRING	'ISSNA', 'ISSWA'	TLM – SH bit 0
INSTRUMENT_NAME	Name of the CASSINI Instrument which acquired the image data.	STRING	'IMAGING SCIENCE SUBSYSTEM NARROW ANGLE', 'IMAGING SCIENCE SUBSYSTEM WIDE ANGLE'	TLM – SH bit 0
MISSION_NAME	Mission name associated with the image.	STRING	'CASSINI-HUYGENS'	PDS

TABLE 7.2.3.3 IDENTIFICATION PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
MISSION_PHASE_NAME	Mission phase of which this image is a part.	STRING	'SATURN ORBIT INSERTION', 'SCIENCE_CRUISE', 'SPACE_SCIENCE', 'APPROACH_ SCIENCE', 'TOUR PRE-HUYGENS', 'PHOEBE ENCOUNTER', 'TITAN A ENCOUNTER', 'TITAN B ENCOUNTER', 'HUYGENS DESCENT', 'HUYGENS PROBE SEPARATION', 'TITAN C HUYGENS', 'TOUR'	MIPL catalog (missionPhases.mission PhaseName)
OBSERVATION_ID	Name of observation of which this image is a part. NOTE: The basic source of this value is the Request Name (up to any "$" delimiter) from Predicted Events File (PEF). There are no checks performed by IO/MIPL to ensure that values for this keyword conform to PDS standards.	STRING		PEF via MIPL catalog (issPredTour. observationId)
PRODUCT_CREATION_ TIME	Time of creation of this image on the ground (Pacific local time). ASCII CCSDS format: yyyy-dddThh:mm:ss.fffZ	DATE	Example: 1996-158T05:53:34.000Z	MIPL

TABLE 7.2.3.3 IDENTIFICATION PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
PRODUCT_ID	Unique identifier for each image commanded. Required by PDS. The PRODUCT_ID will be constructed: SPACECRAFT_CLOCK_ CNT_ PARTITION"_"ISPACECRAFT_ CLOCK_ STOP_COUNT, where I is "N" if the INSTRUMENT_ID is 'ISSNA', and I is "W" if the INSTRUMENT_ID is 'ISSWA'.	STRING	Example: 1_N832898284.123	MIPL
PRODUCT_VERSION_ TYPE	Identifies the version of an individual data product. Always 'FINAL' for products archived with PDS. 'PRELIMINARY' indicates additional processing is underway at IO/MIPL, for instance, to recover additional telemetry if possible.	STRING	'PRELIMINARY', 'FINAL'	MIPL
SEQUENCE_ID	Identifies the segment associated with this image. Note that this keyword does not come from the IOI file.	STRING	Example: 'C22'	MIPL catalog: (issPredTour. sequenctId)
SEQUENCE_NUMBER	Indicates the order in which this image was expected to be taken within the given observation (OBSERVATION_ID). Note: In the event that images are missing, values for this keyword will not be sequential. This value is not unique outside the given observation.	INTEGER		Calculated by MIPL based on PEF and IOI file. Stored in MIPL catalog: (issPredTour.sequence Number)
SEQUENCE_TITLE	The name assigned by the Team Lead for the activity of which this image is a part. Comes from	STRING	This value is defaulted	TL via IOI file and MIPL catalog:

	the SEQUENCE_TITLE keyword in the IOI file. Limited to 60 characters.		to ‘N/A’.	(issParamHeaderTour. sequenceTitle)

TABLE 7.2.3.3 IDENTIFICATION PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
SPACECRAFT_CLOCK_ CNT_PARTITION	Indicates the clock partition active for the SPACECRAFT_CLOCK_START_ COUNT and SPACECRAFT_CLOCK _STOP_ COUNT elements. Remains at 1 unless the spacecraft clock rolls over or is reset.	INTEGER	>=1	MIPL catalog(issPredTour. spacecraft ClockCnt Partition)
SPACECRAFT_CLOCK_ START_COUNT	The seconds and subRTI portions of the spacecraft clock at shutter open. Calculated from spacecraft clock of shutter close less the exposure duration. When the shutter is inhibited (ie SHUTTER_STATE_ID='DISABLED'), the SPACECRAFT_CLOCK_START_COUNT = SPACECRAFT_CLOCK_STOP_COUNT, and both represent the start of the exposure window during the prepare cycle of the image. Format: seconds.subRTIs	STRING	Example: 832898283.123	TLM – Calculated from SPACECRAFT_CLOC K_ STOP_COUNT and EXPOSURE_ DURATION
SPACECRAFT_CLOCK_ STOP_COUNT	The seconds and subRTI portions of the spacecraft clock at shutter close. (A subRTI is approximately 4 msec (1/256 second)). When the shutter is inhibited (ie SHUTTER_STATE_ID='DISABLED'), the SPACECRAFT_CLOCK_START_COUNT = SPACECRAFT_CLOCK_STOP_COUNT, and both represent the start of the exposure window during the prepare cycle of the image. Format: seconds.subRTIs	STRING	Example: 832898283.123	TLM – packet header

TABLE 7.2.3.3 IDENTIFICATION PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
START_TIME	Time of shutter open. Calculated from spacecraft clock of shutter close less the exposure duration. Expressed in UTC format, and includes subRTI resolution. (A subRTI is approximately 4 msec (1/256 second)). When the shutter is inhibited (ie SHUTTER_STATE_ID='DISABLED'), the START_TIME = STOP_TIME, and both represent the start of the exposure window during the prepare cycle of the image.	DATE	Example: 1996-158T05:53:34.000Z	TLM – Calculated from SPACECRAFT_CLOCK_ STOP_COUNT and EXPOSURE_ DURATION
STOP_TIME	Time of shutter close from spacecraft clock (UTC).. Includes subRTI resolution. (A subRTI is approximately 4 msec (1/256 second)). When the shutter is inhibited (ie SHUTTER_STATE_ID='DISABLED'), the START_TIME = STOP_TIME, and both represent the start of the exposure window during the prepare cycle of the image.	DATE	Example: 1996-158T05:53:34.000Z	TLM – packet header
TARGET_DESC	The name of the intended target for which the exposure was calculated/selected in the given image. May include calibration type information. Limited to 75 characters. (Comes from the TARGET_DESC keyword in the IOI file.)	STRING		TL via IOI file and MIPL catalog (issParamTour.target Desc)

TABLE 7.2.3.3 IDENTIFICATION PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
TARGET_LIST	List of all Saturnian system bodies within the field of view. Note: This information is derived from star tracking data and the spacecraft and planetary body ephemerides, and is limited to the accuracy of that set of data.	STRING	'N/A' for all products generated by IO/MIPL.	MIPL initially, then updated by TL for archive.
TARGET_NAME	Name of the target being imaged. NOTE: The basic source of this value is the Predicted Events File (PEF) which contains the targeting SCART. There are no checks performed by IO/MIPL to ensure that values for this keyword also appear in the PDS Data Dictionary. Also, this value may not be correct for retargetables.	STRING		PEF via MIPL catalog (issPredTour. scartTarget Name)

TABLE 7.2.3.4 IMAGE PROPERTY LABEL

Keyword	*Description*	*Type*	*Valid Values*	*Source*
BIAS_STRIP_MEAN	Mean value of the overclocked pixel values from all	REAL		MIPL –from LH bytes 7

	lines except the first and last. Not affected by light or dark current. Before C32, when FLIGHT_SOFTWARE_VERSION = 1.2, this uses one overclocked pixel value per line. This value should be ignored for LOSSY compressed data as it does not contain valid data. During C32 (beginning at SCLK_START_COUNT_SECONDS = 1401927444), when FLIGHT_SOFTWARE_VERSION = 1.3, this uses six overclocked pixel values per line. This value should be ignored for LOSSY compressed data as it does not contain valid data. When FLIGHT_SOFTWARE_VERSION = 1.4, for Lossy compressed data, this value is the mean of the overclocked pixel sum returned in the last compression block of the image.			& 8, averaged over entire image.

TABLE 7.2.3.4 IMAGE PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
DARK_STRIP_MEAN	Mean value of the extended pixel values from all lines except the first and last. Not affected by light, but by dark current and Dark Band problem. For FLIGHT_SOFTWARE_VERSION_ID=1.2 or 1.3, this value should be ignored for LOSSY compressed data as it does not contain valid data. When the FLIGHT_SOFTWARE_VERSION_ID = "1.4" , for Lossy compressed data this value is the mean of the extended pixel sum returned in the last compression block for the image.	REAL		MIPL – calculated from LH bytes 5 & 6, averaged over entire image.
DATA_CONVERSION_ TYPE	The method of conversion used to convert image from 12 to 8 bits selected for this image.	STRING	'12BIT' = no conversion 'TABLE' = conversion by look-up table '8LSB' = keep only the 8 least significant bits	TLM – SH bits 6 & 7
MISSING_LINES	For non-lossy compressed data only, number of missing or incomplete image lines. For all data, including lossy compressed images, when data is missing, the missing pixel values are replaced by 0.	INTEGER	'N/A' for lossy compressed data.	MIPL

TABLE 7.2.3.5 INSTRUMENT PROPERTY LABEL

Keyword	*Description*	*Type*	*Valid Values*	*Source*
ANTIBLOOMING_STATE_FLAG	Indicator of whether antiblooming was used for this image.	STRING	'ON' 'OFF' 'UNK' if extended header is unavailable and database predict can't be found.	TLM – XH bit 104 or MIPL catalog: (issParamTour.antiBloomingStateFlag)

TABLE 7.2.3.5 INSTRUMENT PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
CALIBRATION_LAMP_STATE_FLAG	Indicator of whether calibration lamp was used for this image. (ISSNA has none, so it's always 'N/A')	STRING	'ON', 'OFF', 'N/A' 'UNK' if extended header is unavailable and database predict can't be found.	TLM – XH bit 99 or MIPL catalog: (issParamTour.commandedCalLampStateFlag)
DELAYED_READOUT_FLAG	Indicator of whether the image may have waited on the CCD while the other camera was performing a readout.	STRING	'YES','NO' 'UNK' if extended header is unavailable and database predict can't be found.	TLM – calculated from SH bit 0 (camera id), EX bit 439 (both) and XH bit 405 (order) or MIPL catalog: (issParamTour.readOutOrder)

DETECTOR _TEMPERATURE	The temperature of the CCD.	REAL (degrees C)	-999.0 if extended header is unavailable.	TLM – XH bits 208-224
EXPOSURE_DURATION	The exposure duration for the image.	REAL (milli-seconds)	63 distinct values from 0 to 1200000.) (See Table 8.1 in Appendix A.) -999.0 if extended header is unavailable and database predict can't be found.	TLM – XH 8 bit index starting at bit 408 or MIPL catalog: (issParamTour. exposureDuration)
FILTER_NAME	A two valued array naming the optical filters used for this image. The first value pertains to Filter Wheel 1, the second value pertains to Filter Wheel 2.	(STRING, STRING)	The format is (Filter1, Filter2) (See Table 8.2 in Appendix A.)	TLM – SH 4 bit index: Filter 1 starts at bit 13, Filter 2 starts at bit 17.

TABLE 7.2.3.5 INSTRUMENT PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
FILTER_TEMPERATURE	Temperature of the filter wheels.	REAL (degrees C)	-999.0 if housekeeping is unavailable.	TLM – Housekeeping channels: NAC s-0502, WAC s-0506
FLIGHT_SOFTWARE_ VERSION_ID	Indicates version of instrument flight software used to acquire image.	STRING		MIPL via catalog (fswVersions. fswVersionId)
GAIN_MODE_ID	The electronics gain setting selected for this image, given in units of electrons per DN. (This is an approximate value so both cameras can use the same set of values.)	STRING	'12 ELECTRONS PER DN', '29 ELECTRONS PER DN', '95 ELECTRONS PER DN', '215 ELECTRONS PER DN'	TLM – SH bits 11 & 12
INSTRUMENT_DATA_ RATE	The rate at which data was transferred out of instrument.	REAL (kilobits/ second)	60.9, 121.9, 182.8, 243.7, 304.6, 365.6 -999.0 if extended header and channelized engineering data are unavailable.	TLM – XH 4 bits, starting at bit 112 else TLM – channels C-2034 and C-2060.
INSTRUMENT_MODE_ID	The summation mode used for this image.	STRING	'FULL','SUM2','SUM4'	TLM – SH bit 1 & 2 (See Table 8.5 in Appendix A.)

TABLE 7.2.3.5 INSTRUMENT PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
LIGHT_FLOOD_STATE_ FLAG	Indicator of whether Light Flood was used just prior to taking this image.	STRING	'ON', 'OFF' 'UNK' if extended header is unavailable and database predict can't be found.	TLM – XH bit 50 or MIPL catalog: (issParamTour.light FloodStateFlag)
METHOD_DESC	This keyword describes the information and/or algorithm used to calculate the I/F value used by the ISS team to determine the EXPOSURE_DURATION. (Limited to char(75)). (Comes from the METHOD_DESC keyword in the IOI file.)	STRING		TL via IOI file and MIPL catalog (issParamTour.method Desc)
OPTICS_TEMPERATURE	A two valued array describing optics temperature. The first element of the array pertains to the front optics temperature, and the second element pertains to the rear optics. Note that there is no rear optics temperature for the WAC camera, so when INSTRUMENT_ID = ISSWA, the second element of the array will always be -999.0.	(REAL, REAL) (degrees C)	(-999.0, -999.0) if the extended header is unavailable.	TLM – XH bits 224 - 240
PREPARE_CYCLE _INDEX	The element number within the Prepare Cycle table selected for this image.	INTEGER	0 – 15 (See Table 8.3 in Appendix A.) 'UNK' if extended header is unavailable and database predict can't be found.	TLM – XH bits 57 – 60 or MIPL catalog: (issParamTour.prepare CycleIndex)

TABLE 7.2.3.5 INSTRUMENT PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
READOUT_CYCLE _INDEX	The element number within the Readout Cycle table selected for this image.	INTEGER	0 – 15 (See Table 8.4 in Appendix A.) 'UNK' if extended header is unavailable and database predict can't be found.	TLM – XH bits 61 – 64 or MIPL catalog: (issParamTour.readOutCycleIndex)
SENSOR_HEAD_ELEC _TEMPERATURE	Temperature of the sensor head electronics.	REAL (degrees C)	-999.0 if housekeeping is unavailable.	TLM – Housekeeping channels: NAC s-0503, WAC s-0507
SHUTTER_MODE_ID	Indicator of whether this exposure was part of a joint observation with the other ISS camera.	STRING	'BOTSIM','NACONLY', 'WACONLY','UNK' 'UNK' if extended header is unavailable and database predict can't be found.	TLM – Calculated from XH bit 439 (both) and SH bit 0 (camera) or MIPL catalog: (issParamTour.shutterModeId)
SHUTTER_STATE_ID	Indicator of whether the shutter was enabled during the exposure.	STRING	'ENABLED', 'DISABLED' 'UNK' if extended header is unavailable and database predict can't be found.	TLM – XH bit 407 or MIPL catalog: (issParamTour.shutterStateId)

TABLE 7.2.3.6 TELEMETRY PROPERTY LABEL

Keyword	*Description*	*Type*	*Valid Values*	*Source*
EARTH_RECEIVED_ START_TIME	Earth Received time of the earliest record containing valid data for this image (UTC). ASCII Consultative Committee on Space and Data Standards(CCSDS) format: yyyy-dddThh:mm:ss.fffZ (T is a delimitter between date and time).	DATE		TLM – earliest SFDU header used in generating image
EARTH_RECEIVED_ STOP_TIME	Earth Received time of the latest record containing valid data for this image (UTC). ASCII CCSDS format: yyyy-dddThh:mm:ss.fffZ	DATE		TLM – latest SFDU header used in generating image
EXPECTED_PACKETS	This keyword provides the total number of packets expected to be stored on the SSR for this image. To convert to volume in bits, multiply this value by 7616 bits/packet. (Comes from the EXPECTED_PACKETS keyword in the IOI file.)	INTEGER	1 - 2277	TL via IOI file and MIPL catalog (issParamTour.expectedPackets)
MISSING_PACKET_FLAG	Indicator of whether consecutive packets were received. If set to 'YES', this flag indicates that packets needed to construct a complete image were missing. If set to 'NO', all consecutive packets were received. However, data may be missing at the beginning or end of the image. In this case, missing data would be reflected in the MISSING_LINES keyword for non-lossy data, and through visual inspection for lossy compressed data.	STRING	'YES', 'NO'	MIPL

TABLE 7.2.3.6 TELEMETRY PROPERTY LABEL (CONTINUED)

Keyword	*Description*	*Type*	*Valid Values*	*Source*
RECEIVED_PACKETS	This keyword provides the actual number of packets received from the SSR for this image. To convert to volume in bits, multiply this value by 7616 bits/packet. This value reflects data received. In the event the image is incomplete due to an outage in the transmission, this field will not be an accurate indicator of actual volume on the SSR.	INTEGER	1 - 2277	MIPL
SOFTWARE_VERSION_ID	Ground software version used to generate this image.	STRING		MIPL
TELEMETRY_FORMAT_ ID	The telemetry mode in effect when sending data from the instrument to the spacecraft computer.	STRING	'S_N_ER_1', 'S_N_ER_2', 'S_N_ER_3', 'S_N_ER_4', 'S_N_ER_5', 'S_N_ER_5A', 'S_N_ER_6', 'SAF_142200' 'UNK' if channelized engineering data is not available.	TLM – channels C-2034 and C-2060.

7.3 Binary Telemetry Header Record

7.3.1 Introduction

This record holds machine-readable information which is applies to the image as a whole. Many of these items are in the VICAR Label as well, but non-VICAR sites may ignore the VICAR Label and use the Binary Telemetry Header to construct their own human-readable label. This record contains 60 bytes of information and is subsequently padded out to the image record length with zeroes. Items in this header are copied directly from the Extended ISS Science header returned in telemetry,

7.3.2 Record Structure

Table 7.3.2 describes each item in the Binary Telemetry Header Record in terms of its name, size, definition and possible values.

TABLE 7.3.2 BINARY HEADER

Field	*Size (bits)*	*Start Bit*	*Description*	*Valid Values*
Camera	1	0	Camera that generated packet	0: NAC 1: WAC
Summation Mode	2	1	1x1, 2x2, 4x4	01: 1x1 10: 2x2 11: 4x4
Compression	2	3	Compression style	00: no compression 01: lossless 10: lossy 11: illegal
Conversion	2	5	Conversion type	00: no conv 01: 8 lsb 10: 12-8 lut

				11: illegal

TABLE 7.3.2 BINARY HEADER (CONTINUED)

Field	*Size (bits)*	*Start Bit*	*Description*	*Valid Values*
Header Type	2	8	Indicates whether the header is standard or extended	00: standard 01: illegal 10: illegal 11: extended
Gain	2	10	Gain state	0 to 3
Filter 1	4	12	Position of filter wheel 1	1 to 12 (See Table 8.2 in Appendix A.)
Filter 2	4	16	Position of filter wheel 2	1 to 12 (See Table 8.2 in Appendix A.)
Image Line	12	20	The line number of the first line in the packet. May refer to a partial line if the first line has been continued from the preceding packet.	0 to 1023
Last Packet	1	32	Indicate whether the current packet is the last for the image.	0: not the last 1: the last
Spare 0	2	33	Unused	
Lossy Parameters	7	35	Number of blocks in a group	0 to 255 (Value is calculated by multiplying by 2 and adding 1)
	4	42	Quantization factor index	0 to 15
	1	46	Algorithm flag	0 or 1
	1	47	Type of blocks	0 or 1
Spare 1	1	48	Unused	

Cal Lamp	1	49	State of Lamp	0: Off 1: On

TABLE 7.3.2 BINARY HEADER (CONTINUED)

Field	*Size (bits)*	*Start Bit*	*Description*	*Valid Values*
Light Flood/Erase	1	50	CCD Flood Light and Erase On or Off	0: Off 1: On
Optics Heater 1	1	53	Heater On or Off	0: Off 1: On
Optics Heater 2	1	54	Heater On or Off	0: Off 1: On
Anti-Blooming	1	55	Anti-Blooming on/off	0: Off 1: On
Prepare Index	4	56	Prepare table index for the current image.	0 to 15
Read Out Index	4	60	Index of the current readout table entry used for this image.	0 to 15
Table Data	4	64	Table ID: The table data field commutates certain tables into the science header. This sub-field identifies the table being commutated.	0000: Exp 0001: Prep 0010: RO
	12	68	Entry: The byte number of the table entry.	
	16	80	Entry Contents: The contents of the byte in the table.	
Image counter	16	96	This field holds the image number since POR. A zero here indicates that no images have been returned since power on reset (POR).	The number starts at 1 and proceeds to 32767 and recycles to 1 after that.
Telemetry rate	4	112	The number of packets transferred from the	0 to 6

			instrument to the CDS per RTI.	

TABLE 7.3.2 BINARY HEADER (CONTINUED)

Field	*Size (bits)*	*Start Bit*	*Description*	*Valid Values*
+50V	12	116	The voltage measurement of the +50V supply to the shutter capacitors (expressed in DN)	
+30V	16	128	The voltage measurement of the +30V main voltage supply (expressed in DN)	
+28V	16	144	The voltage measurement of the +28V supply to filter wheels and heaters (expressed in DN)	
+15V	16	160	The voltage measurement of the +12V supply to CCD heater (expressed in DN)	
-15V	16	176	The voltage measurement of the -12V supply to CCD heater (expressed in DN)	Varies from -12 to 0 depending upon the state of the CCD heater.
+5V	16	192	The voltage measurement of the +5V supply for logic (expressed in DN)	
CCD temp	16	208	Temperature of the CCD detector (degrees C, expressed in DN)	
Optics (1)	16	224	Temperature of the Optics (WAC) or Front Optics (NAC) (degrees C, expressed in DN)	
Optics (2)	16	240	Temperature of the Optics (WAC) or Rear Optics (NAC) (degrees C, expressed in DN)	
Optics (3)	16	256	Temperature of the Optics (WAC) or Front Optics (NAC) (degrees C, expressed in DN)	
Optics (4)	16	272	Temperature of the Optics (WAC) or Rear Optics	

			(NAC) (degrees C, expressed in DN)	
EFC Temp 1	16	288	Temperature of the Engineering Flight Computer (degrees C, expressed in DN)	
EFC Temp2	16	304	Temperature of the Engineering Flight Computer (degrees C, expressed in DN)	
MEA Temp	16	320	Temperature of the Main Electronics Assembly (degrees C, expressed in DN)	

TABLE 7.3.2 BINARY HEADER (CONTINUED)

Field	*Size (bits)*	*Start Bit*	*Description*	*Valid Values*
Instrument Current	16	336	Main Power current from +30V supply (milliamperes)	
Trigger	16	352	The command ID of the last command triggered.	
Command	16	368	Number commands since POR.	The number starts at 0 and proceeds to 32767 and recycles to 0.
Software	8	400	Bits indicating certain Flight Software states and conditions.	0: 0: upload empty 0: 1: uploadfull 1: 0: no recent POR 1: 1: POR in last hkp.interval 2: 0: NAC RO 1st 2: 1: WAC RO 1st 3...7: unused
Exposure	8	408	An index into the exposure table for the current image.	0 to 63
VREF_LO	16	416	The low reference voltage for the temperature sensors (volts)	
VREF_HI	16	432	The high reference voltage for the temperature sensors (volts)	
Spare 2	32	448	Unused	

7.4 Line Records

7.4.1 Introduction

There is one Line Record for each image line. Each contains a Binary Prefix of 24 bytes followed by the 8- or 16-bit pixel data for the line. The Prefix contains machine-readable information about the image line derived from the telemetry. This information may vary from line to line and thus is not placed in the Binary Telemetry Header.

In the event of Lossy compressed data, the data are no longer associated with lines. The number of records received depends on compression efficiency, but there is no way to associate a given record with a line number. In this case, the Binary Line Prefix contains information extracted from the lossy records received.

7.4.2 Record Structure

Table 7.4.2 describes each item in the image Line Records in terms of its name, size and description. The Prefix is composed of the Line Number from the Standard Header, the Extended and Overclocked pixels from the Line Header and values indicating the location of received pixel data..

The pixels in a given line may come from up to 4 packets. Therefore, a line could appear to have as many as 2 line segments of good data accompanied by line segments zero-filled missing data. The Prefix specifies the location of beginning and end of these good line segments.

TABLE 7.4.2 BINARY LINE PREFIX

Item	*Size*	*Start Byte*	*Description*
Line Number	2 bytes	0	The image line number of this record. Maintained at proper value even through data gaps.
Last Valid Pixel	2 bytes	2	Element position of the last valid pixel in this line not artificially set to zero due to missing data. Set to zero for missing lines. Set to 1024, 512 or 256 for complete lines.

TABLE 7.4.2 BINARY LINE PREFIX (CONTINUED)

Item	*Size*	*Start Byte*	*Description*
First Pixel of Segment 1	2 bytes	4	Element position of the first pixel of the first line segment containing valid data. Set to zero for missing lines.
Last Valid Pixel of Segment 1	2 bytes	6	Element position of the last valid pixel of the first line segment containing valid data. Set to zero for missing lines.
First Pixel of Segment 2	2 bytes	8	Element position of the first pixel of the second line segment containing valid data. Set to zero for missing lines or if only one segment exists.
Last Valid Pixel of Segment 2	2 bytes	10	Element position of the last valid pixel of the second line segment containing valid data. Set to zero for missing lines or if only one segment exists.
First Overclocked Pixel Sum	2 bytes	12	Sum of up to two overclocked pixels returned at the beginning of this line. In 1X1 mode, this will be the sum of the first 2 overclocked pixels, in 2X2 and 4X4 mode it will be the first overclocked pixel.
Spare	6 bytes	14	Unused
Extended Pixel Sum	2 bytes	20	Prior to ISS FSW 1.4, this was the value of the Extended pixel returned for this line. For lossy-compressed data: the value of the last available Extended pixel value. For 8-bit data, one 8-bit pixel value is returned right-adjusted in the 16-bit word. When the FLIGHT_SOFTWARE_VERSION_ID = "1.4" this value is the sum of up to 8 extended pixels returned for this line. In 1X1 mode, this will be the sum of 8 values, in 2X2 mode, this will be the sum of 4 values, and in 4X4 mode, it will be the sum of 2 extended pixel values. For Lossy compressed data, the extended pixel sum is only returned in the last compression block. Accordingly, this value will be 0 except for all lines except those from the last compression block.
Last Overclocked Pixel Sum	2 bytes	22	Sum of up to six overclocked pixels returned at the end of this line. In 1X1 mode, this will be the sum of the last 6 overclocked pixels, in 2X2 mode the sum of the last 3 overclocked pixels and in 4X4 mode the last overclocked pixel.

Pixel Data	2048 Bytes 1024 Bytes 512 Bytes 256 Bytes	24	Pixel data for this line.

8. APPENDIX A: Tables

Table 8.1 EXPOSURE_DURATION Table

Indices and Exposure Times (msec)

Index	*Time*		*Index*	*Time*		*Index*	*Time*		*Index*	*Time*
0	0		16	150		32	3200		48	68000
1	5		17	180		33	3800		49	82000
2	10		18	220		34	4600		50	100000
3	15		19	260		35	5600		51	120000
4	20		20	320		36	6800		52	150000
5	25		21	380		37	8200		53	180000
6	30		22	460		38	10000		54	220000
7	35		23	560		39	12000		55	260000
8	40		24	680		40	15000		56	320000
9	50		25	820		41	18000		57	380000
10	60		26	1000		42	22000		58	460000
11	70		27	1200		43	26000		59	560000
12	80		28	1500		44	32000		60	680000
13	90		29	1800		45	38000		61	1000000
14	100		30	2000		46	46000		62	1200000
15	120		31	2600		47	56000		63	No Op [1]

[1] With exposure index 63, there is no camera mechanism movement occurring (e.g., no shutter reset, no exposure, no CCD readout).

Table 8.2 NAC and WAC FILTER_NAME Table

Index	*NAC Filter Wheel # 1*	*NAC FW1 Central Wavelength (nm)*	*NAC Filter Wheel # 2*	*NAC FW2 Central Wavelength (nm)*	*WAC Filter Wheel # 1*	*WAC FW1 Central Wavelength (nm)*	*WAC Filter Wheel # 2*	*WAC FW2 Central Wavelength (nm)*
1	CL1	N/A	CL2	N/A	CL1	N/A	CL2	N/A
2	RED	650W	GRN	462W	IR3	952W	RED	650W
3	BL1	445W	UV3	340W	IR4	977LP	GRN	562W
4	UV2	300W	BL2	440M	IR5	1025LP	BL1	445W
5	UV1	255W	MT2	727N	CB3	938N	VIO	430SP
6	IRP0	N/A	CB2	751N	MT3	889N	HAL	656N
7	P120	N/A	MT3	889N	CB2	751N	IRP90	N/A
8	P60	N/A	CB3	938N	MT2	727N	IRP0	N/A
9	P0	N/A	MT1	619N	IR2	867W	IR1	757W
10	HAL	656N	CB1	619N, 634N*	N/A	N/A	N/A	N/A
11	IR4	977LP	IR3	952W	N/A	N/A	N/A	N/A
12	IR2	867W	IR1	757W	N/A	N/A	N/A	N/A

* Note: CB1 is a double lobed filter.

Table 8.3 PREPARE_CYCLE_INDEX Table

Prepare Cycle – Indices and Windows

Index	*NAC Filter Wheel (sec)*	*WAC Filter Wheel (sec)*	*Exposure Window (sec)*	*TOTAL Prepare Time (NAC or WAC)*	*TOTAL Prepare Time (BOTSIM)*
0	1	1	2	4.475	5.475
1	2	2	2	5.475	7.475
2	3	3	2	6.475	9.475
3	5	5	2	8.475	13.475
4	5	5	5	11.475	16.475
5	5	5	13	19.475	24.475
6	5	5	21	27.475	32.475
7	5	5	37	43.475	48.475
8	5	5	53	59.475	64.475
9	5	5	85	91.475	96.475
10	5	5	117	123.475	128.475
11	5	5	181	187.475	192.475
12	5	5	245	251.475	256.475
13	5	5	501	507.475	512.475
14	5	5	1013	1019.475	1024.475
15	5	5	1201	1207.475	1212.475

Table 8.4 READOUT_CYCLE_INDEX Table

Index	*NAC Readout (sec)*	*WAC Readout (sec)*	*TOTAL Readout Time (NAC or WAC)*	*TOTAL Readout Time (BOTSIM)*
0	50	50	50.525	100.525
1	50	25		75.525
2	50	14		64.525
3	50	6		56.525
4	25	50		75.525
5	25	25	25.525	50.525
6	25	14		39.525
7	25	6		31.525
8	14	50		64.525
9	14	25		39.525
10	14	14	14.525	28.525
11	14	6		20.525
12	6	50		56.525
13	6	25		31.525
14	6	14		20.525
15	6	6	6.525	12.525

Note: The readout times provided above apply when the data rate is 48 packets/second. The readout time for other data rates is:

Readout Time = round_to_integer(readout time in table * data_rate/48)

Table 8.5 Full-Well Saturation (VALID_MAXIMUM) Table

Minimum Full Well Capacity (DN)	*INSTRUMENT_ID*	*GAIN_MODE_ID (e/DN)*	*INSTRUMENT_MODE_ID*
9896	ISSNA	12	FULL
4095	ISSNA	29	FULL
1250	ISSNA	95	FULL
550	ISSNA	215	FULL
39585	ISSNA	12	SUM2
16380	ISSNA	29	SUM2
5000	ISSNA	95	SUM2
2210	ISSNA	215	SUM2
15104	ISSNA	12	SUM4
6250	ISSNA	29	SUM4
1908	ISSNA	95	SUM4
843	ISSNA	215	SUM4
9896	ISSWA	12	FULL
4095	ISSWA	29	FULL
1250	ISSWA	95	FULL
550	ISSWA	215	FULL
39585	ISSWA	12	SUM2
16380	ISSWA	29	SUM2
5000	ISSWA	95	SUM2
2210	ISSWA	215	SUM2
12882	ISSWA	12	SUM4
5330	ISSWA	29	SUM4
1627	ISSWA	95	SUM4
719	ISSWA	215	SUM4

9. APPENDIX B: Acronyms

DB	Database
IO	Instrument Operations
IOI	Instrument Operations Interfacefile
ISS	Imaging Science Subsystem
ISSNA	ISS Narrow Angle Camera
ISSWA	ISS Wide Angle Camera
MIPL	Multimission Image Processing Laboratory
NAC	(ISS) Narrow Angle Camera
PDS	Planetary Data System
PEF	Predicted Events File
SH	Standard ISS Science Header
SIS	Software Interface Specification
TL	Team Lead
TLM	Telemetry
VICAR	Video Image Communications And Retrieval
WAC	(ISS) Wide Angle Camera
XH	Extended ISS Science Header

10. APPENDIX C: Sample VICAR Label

```
************  File /project/cassini/casIss/N1347929960_1.IMG ************
        3 dimensional IMAGE file
        File organization is BSQ
        Pixels are in HALF format from a SUN-SOLR host
        1 bands
        1024 lines per band
        1024 samples per line
        1 lines of binary header of type CAS-ISS3
        24 bytes of binary prefix per line

---- Property: INSTRUMENT ----
ANTIBLOOMING_STATE_FLAG='ON'
CALIBRATION_LAMP_STATE_FLAG='N/A'
DELAYED_READOUT_FLAG='NO'
DETECTOR_TEMPERATURE=-89.2435
EXPOSURE_DURATION=2600.0
FILTER_NAME=('CL1', 'MT3')
FILTER_TEMPERATURE=-84.3428
FLIGHT_SOFTWARE_VERSION_ID='1.2'
GAIN_MODE_ID='29 ELECTRONS PER DN'
INSTRUMENT_DATA_RATE=182.784
INSTRUMENT_MODE_ID='FULL'
LIGHT_FLOOD_STATE_FLAG='ON'
METHOD_DESC='MANUAL , MAXIOF IS 0.00000001, ISSPT_V4.2'
OPTICS_TEMPERATURE=(0.712693, 0.54321)
PREPARE_CYCLE_INDEX=4
READOUT_CYCLE_INDEX=7
SENSOR_HEAD_ELEC_TEMPERATURE=-83.5755
SHUTTER_MODE_ID='NACONLY'
SHUTTER_STATE_ID='ENABLED'

---- Property: IMAGE ----
BIAS_STRIP_MEAN=0.0
```

DARK_STRIP_MEAN=14.3623
DATA_CONVERSION_TYPE='12BIT'
MISSING_LINES=0

---- Property: COMMAND ----
COMMAND_FILE_NAME=’trigger_286_3.ioi’
ORDER_NUMBER=4
COMMAND_SEQUENCE_NUMBER=286
ELECTRONICS_BIAS=112
PARALLEL_CLOCK_VOLTAGE_INDEX=9

---- Property: IDENTIFICATION ----
DATA_SET_ID=’CO-J-ISSNA/ISSWA-2-EDR-V1.0’
DESCRIPTION=’N/A’
IMAGE_MID_TIME='2000-262T00:48:43.223Z'
IMAGE_NUMBER=’1347929960’
IMAGE_OBSERVATION_TYPE=(‘CALIBRATION’,’ENGINEERING’)
IMAGE_TIME='2000-262T00:48:44.523Z'
INSTRUMENT_HOST_NAME='CASSINI ORBITER'
INSTRUMENT_ID='ISSNA'
INSTRUMENT_NAME='IMAGING SCIENCE SUBSYSTEM NARROW ANGLE’
MISSION_NAME=’CASSINI-HUYGENS ‘
MISSION_PHASE_NAME=’SCIENCE CRUISE’
OBSERVATION_ID='ISS_C22ST_FOMALHAUT'
PRODUCT_CREATION_TIME='2000-270T14:18:51.000'
PRODUCT_ID='1_N1347929960.123'
PRODUCT_VERSION_TYPE='FINAL'
SEQUENCE_ID='C22'
SEQUENCE_NUMBER=27
SEQUENCE_TITLE='STAR CALIBRATION'
SPACECRAFT_CLOCK_CNT_PARTITION=1
SPACECRAFT_CLOCK_START_COUNT='1347929957.223'
SPACECRAFT_CLOCK_STOP_COUNT='1347929960.123'
START_TIME='2000-262T00:48:41.923Z'
STOP_TIME='2000-262T00:48:44.523Z'
TARGET_DESC=’88 AQR’
TARGET_LIST=’N/A’
TARGET_NAME='FOMALHAUT'

---- Property: TELEMETRY ----
EARTH_RECEIVED_START_TIME='2000-263T01:18:59.627Z'
EARTH_RECEIVED_STOP_TIME='2000-263T01:19:36.171Z'
EXPECTED_PACKETS=275
MISSING_PACKET_FLAG='NO'
RECEIVED_PACKETS=295
SOFTWARE_VERSION_ID='ISS V3.1 9-20-2000'
TELEMETRY_FORMAT_ID=''S_N_ER_3'

---- Property: COMPRESSION ----
EXPECTED_MAXIMUM=(100.0, 100.0)
VALID_MAXIMUM=(4095,4095)
INST_CMPRS_PARAM=('N/A', 'N/A', 'N/A', 'N/A')
INST_CMPRS_RATE=(1.5,1.35)
INST_CMPRS_RATIO=5.92038
INST_CMPRS_TYPE='LOSSLESS'
---- Task: TASK -- User: casrt -- Tue Sep 26 14:12:03 2000 ----

****

11. APPENDIX D: Sample Detached PDS Label

PDS_VERSION_ID = PDS3

/* FILE CHARACTERISTICS */

RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES = 2072
FILE_RECORDS = 1027

/* POINTERS TO DATA OBJECTS */

^IMAGE_HEADER = ("N1347928997_1.IMG",1)
^TELEMETRY_TABLE = ("N1347928997_1.IMG",3)
^LINE_PREFIX_TABLE = ("N1347928997_1.IMG",4)
^IMAGE = ("N1347928997_1.IMG",4)

/* IDENTIFICATION DATA ELEMENTS */

ANTIBLOOMING_STATE_FLAG = "ON"
BIAS_STRIP_MEAN = 0.000000
CALIBRATION_LAMP_STATE_FLAG = "N/A"
COMMAND_FILE_NAME = “trigger_286_3.ioi”
COMMAND_SEQUENCE_NUMBER = 286
DARK_STRIP_MEAN = 14.443359
DATA_CONVERSION_TYPE = "12BIT"
DATA_SET_ID = “CO-J-ISSNA/ISSWA-2-EDR-V1.0”
DELAYED_READOUT_FLAG = "NO"
DESCRIPTION=”N/A”
DETECTOR_TEMPERATURE = -89.243546 <DEGC>
EARTH_RECEIVED_START_TIME = "2000-263T01:05:33.312Z"
EARTH_RECEIVED_STOP_TIME = "2000-263T01:06:05.425Z"
ELECTRONICS_BIAS = 112
EXPECTED_MAXIMUM=(100.0,100.0)
EXPECTED_PACKETS=275
EXPOSURE_DURATION = 2600.000000

FILTER_NAME = (“UV1”,”CL2”)
FILTER_TEMPERATURE = -84.342690
FLIGHT_SOFTWARE_VERSION_ID = "1.2"
GAIN_MODE_ID = "29 ELECTRONS PER DN"
IMAGE_MID_TIME=”2000-262T00:48:43.223Z”
IMAGE_NUMBER = “1347928997”
IMAGE_OBSERVATION_TYPE = {“CALIBRATION”,”ENGINEERING”}
IMAGE_TIME = "2000-262T00:32:41.530Z"
INSTRUMENT_DATA_RATE = 182.783997
INSTRUMENT_HOST_NAME = "CASSINI ORBITER"
INSTRUMENT_ID = "ISSNA"
INSTRUMENT_MODE_ID = "FULL"
INSTRUMENT_NAME = "IMAGING SCIENCE SUBSYSTEM NARROW ANGLE"
INST_CMPRS_PARAM = (“N/A”,”N/A”,”N/A”,”N/A”)
INST_CMPRS_RATE=(1.5,1.35)
INST_CMPRS_RATIO = 5.962934
INST_CMPRS_TYPE = "LOSSLESS"
LIGHT_FLOOD_STATE_FLAG = "ON"
METHOD_DESC=”MANUAL, MAXIOF IS 0.00000001, ISSPT_V4.2”
MISSING_LINES = 0
MISSING_PACKET_FLAG = "NO"
MISSION_NAME = “CASSINI-HUYGENS “
MISSION_PHASE_NAME = “SCIENCE CRUISE”
OBSERVATION_ID = "ISS_C22ST_FOMALHAUT"
OPTICS_TEMPERATURE = (0.712693, , 0.54321)
ORDER_NUMBER=4
PARALLEL_CLOCK_VOLTAGE_INDEX = 9
PREPARE_CYCLE_INDEX = 4
PRODUCT_CREATION_TIME = "2000-270T14:12:03.000"
PRODUCT_ID = "1_N1347928997.123"
PRODUCT_VERSION_TYPE = "FINAL"
READOUT_CYCLE_INDEX = 7
RECEIVED_PACKETS=295
SENSOR_HEAD_ELEC_TEMPERATURE = -83.575539
SEQUENCE_ID = "C22"
SEQUENCE_NUMBER=27
SEQUENCE_TITLE = "STAR CALIBRATION"

```
SHUTTER_MODE_ID = "NACONLY"
SHUTTER_STATE_ID = "ENABLED"
SOFTWARE_VERSION_ID = "ISS V3.1 9-20-2000"
SPACECRAFT_CLOCK_CNT_PARTITION = 1
SPACECRAFT_CLOCK_START_COUNT = "1347928994.223"
SPACECRAFT_CLOCK_STOP_COUNT = "1347928997.123"
START_TIME = "2000-262T00:32:38.930Z"
STOP_TIME = "2000-262T00:32:41.530Z"
TARGET_DESC=”88 AQR”
TARGET_LIST=”N/A”
TARGET_NAME = "FOMALHAUT"
TELEMETRY_FORMAT_ID=”S_N_ER_3”
VALID_MAXIMUM=(4095, 4095)
OBJECT = IMAGE_HEADER
        INTERCHANGE_FORMAT = ASCII
        HEADER_TYPE = VICAR2
        BYTES = 2072
        RECORDS = 1
        ^DESCRIPTION = "VICAR2.TXT"
END_OBJECT = IMAGE_HEADER
OBJECT = TELEMETRY_TABLE
        INTERCHANGE_FORMAT = BINARY
        ROWS = 1
        COLUMNS = 2
        ROW_BYTES = 2072
        ^STRUCTURE = "TLMTAB.FMT"
        OBJECT = COLUMN
                NAME = NULL_PADDING
                DATA_TYPE = MSB_UNSIGNED_INTEGER
                START_BYTE = 61
                BYTES = 2011
        END_OBJECT = COLUMN
END_OBJECT = TELEMETRY_TABLE
OBJECT = LINE_PREFIX_TABLE
        INTERCHANGE_FORMAT = BINARY
        ROWS = 2048
        COLUMNS = 7
```

```
        ROW_BYTES = 24
        ROW_SUFFIX_BYTES = 2048
        ^LINE_PREFIX_STRUCTURE = "PREFIX2.FMT"
END_OBJECT = LINE_PREFIX_TABLE
OBJECT = IMAGE
        LINES = 2048
        LINE_SAMPLES = 2048
        SAMPLE_BITS = 16
        SAMPLE_TYPE = SUN_INTEGER
        LINE_PREFIX_BYTES = 24
END_OBJECT = IMAGE
END
```

12. APPENDIX E: Overclocked and Extended Pixel Values

The content of the VICAR and PDS label items BIAS_STRIP_MEAN (the mean of the overclocked pixel values throughout the image) and DARK_STRIP_MEAN (the mean of the extended pixel values throughout the image) have changed with upgrades to the FLIGHT_SOFTWARE_VERSION ID. The table below (Table 12.1) describes the effect of the INSTRUMENT_MODE_ID, INST_CMPRS_TYPE and DATA_CONVERSION_TYPE on those two keywords.

Table 12.1 BIAS_STRIP and DARK_STRIP VALUES

FSW Version	*INST MODE ID*	*INST CMPRS TYPE*	*DATA CONV TYPE Note: Pixel values are table encoded if LUT*	*FIRST OVERCLOCKED PIXEL SUM (Bin. Line Prefix start byte 12)*	*OVERCLOCKED PIXEL/ LAST OVERCLOCKED PIXEL SUM (Bin. Line Prefix start byte22) Note: BIAS_STRIP_MEAN is derived from these overclocked pixel values from all lines except first and last, unless otherwise noted.)*	*EXTENDED PIXEL (Bin. Line Prefix start byte 20) Note: DARK_STRIP_MEAN is derived from these extended pixel values from all lines except first and last, unless otherwise noted.)*
1.2	FULL	All	12bit	N/A	5th pixel value of 8	5th pixel value of 8
1.2	FULL	LOSSY or LOSSLESS	8LSB or LUT	N/A	5th pixel value of 8	5th pixel value of 8
1.2	FULL	NOTCOMP	8LSB or LUT	N/A	6th pixel value of 8	6th pixel value of 8
1.2	SUM2	All	12bit	N/A	3rd pixel value of 4	3rd pixel value of 4
1.2	SUM2	LOSSY or LOSSLESS	8LSB or LUT	N/A	3rd pixel value of 4	3rd pixel value of 4
1.2	SUM2	NOTCOMP	8LSB or LUT	N/A	4th pixel value of 4	4th pixel value of 4
1.2	SUM4	All	All	N/A	2nd pixel value of 2	2nd pixel value of 2
1.3	FULL	All	12bit	Sum of 2	Sum of 6	5th pixel value of 8
1.3	FULL	LOSSY or LOSSLESS	8LSB or LUT	Sum of 2	Sum of 6	5th pixel value of 8
1.3	FULL	NOTCOMP	8LSB or LUT	Sum of 2	Sum of 6	6th pixel value of 8
1.3	SUM2	All	12bit	First overclocked pixel	Sum of 3	3rd pixel value of 4
1.3	SUM2	LOSSY or LOSSLESS	8LSB or LUT	First overclocked pixel	Sum of 3	3rd pixel value of 4
1.3	SUM2	NOTCOMP	8LSB or LUT	First overclocked pixel	Sum of 3	4th pixel value of 4
1.3	SUM4	All	All	First overclocked pixel	Last overclocked pixel value	2nd pixel value of 2
1.4	FULL	NOTCOMP or LOSSLESS	All	Sum of 2	Sum of 6	Sum of 8 pixels
1.4	FULL	LOSSY	All	Sum of 2. Not returned for all lines, only those from last compression block	Sum of 6. Not returned for all lines, only those from last compression block	Sum of 8. Not returned for all lines, only those from last compression block
1.4	SUM2	NOTCOMP or LOSSLESS	All	First overclocked pixel	Sum of 3	Sum of 4 pixels
1.4	SUM2	LOSSY	All	First overclocked pixel. Not returned for all lines, only those from last compression block	Sum of 3. Not returned for all lines, only those from last compression block	Sum of 4. Not returned for all lines, only those from last compression block
1.4	SUM4	NOTCOMP or LOSSLESS	All	First overclocked pixel	Last overclocked pixel value	Sum of 2 pixels
1.4	SUM4	LOSSY	All	First overclocked pixel. Not returned for all lines, only those from last compression block	Sum of 1. Not returned for all lines, only those from last compression block	Sum of 2. Not returned for all lines, only those from last compression block