2002 Cassini/INMS
Ion and Neutral Mass Spectrometer

INMS STANDARD DATA PRODUCTS AND ARCHIVE VOLUME SOFTWARE INTERFACE SPECIFICATION (INMS Archive Volumes SIS)
SIS ID: IO-AR-016

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Version 2.0
October 1, 2012

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Approved:

J. H. Waite — Date
Team Leader

Diane Conner — Date
Cassini Archive Data Engineer

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1. PREFACE

This document describes the contents and types of volumes belonging to all of the three INMS data sets.

1.1 Distribution List

Table 1: Distribution List

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1.2 Document Change Log

Table 2: Document Change History

Change	Date	Affected Portions
• Initial Draft	01/20/2003	All
• updates based on review by J. Mafi • Added L1A, and TTN data products • Replaced target identifier E/J/S by S in data set names. No Earth or Jupiter Data • Changed directory content tables to reflect the fact that all data is stored in a directories by day of year	12/01/2004	
• Changed document number to reflect draft status, first approved version will be 1.0 • updates based on review by D. Conner • omit event table product. • detailed database schema deleted as unneeded • Improve description of electronic data transfer • Extensive changes based on discussions with discipline node, • Deleted Geometry directory - unneeded	02/15/05	
• Extensive changes based on discussions with discipline node, • Update signature page, reflecting new PDS Project manager • Update reference page to reflect current PDS documentation versions • Expanded descriptions of volume structure • Added map of PKT archive volume to appendices • Simplification of production volume validation	3/1/05	
• Add mission and instrument prefixes to CAT file names • Correct typo's in Data Set Ids. • Add instrument prefix to standard data product Ids • Add PPI Spot check of production file structure • Add EXTRA directory to L1A archive files • Modify volume Ids to permit sequential runs of more than 1000 volumes • Add calibration summary directory to reference volume • Indicate that INMS_L1A volumes will contain calibration summaries valid at the time of volume creation.	3/16/05	
• Move contents of reference volume to EXTRAS Directory on volume COINMS_3000 • Minor editorial changes • Estimate of L1A data volume • Added Appendix D, the L1A Structure	3/31/2005	
• Reflects sample volume delivery • changed specialty of outside peer reviewers	4/15/2005	
• Peer review completed, changed target in data set names to S from SSA	7/1/2005	
• Added Appendix E with housekeeping file format	9/16/2005	Appendix E, section 4.3.3

Table 2: Document Change History		
Change	**Date**	**Affected Portions**
• Updates for revised L1A Data • Added Ion Spectra (L2 Data) • Added Neutral Composition Data		

1.3 TBD Items

Items that are currently TBD or not finalized, but will be defined in the next few months:

Table 3: TBD Items		
Item	**Section**	**Pages**
Monthly Data Volumes	1.6	8

1.4 Acronyms and Abbreviations

Table 4: Acronyms and Abbreviations	
Acronym	**Definition**
ASCII	American Standard Code for Information Interchange
CD-R	Compact Disc - Recordable Media
CD-ROM	Compact Disc - Read-Only Memory
CSN	INMS ion source, Closed Source Neutral
DVD	Digital Versatile Disc
GB	Gigabyte(s)
GSFC	Goddard Space Flight Center
INMS	Ion and Neutral Mass Spectrometer
ISO	International Standards Organization
JHU/APL	Johns Hopkins University / Applied Physics Laboratory
JPL	Jet Propulsion Laboratory
MB	Megabyte(s)
NSSDC	National Space Science Data Center
OSI	INMS ion source, Open Source Ion
OSNB	INMS ion source, Open Source Neutral Beam
OSNT	INMS ion source, Open Source Neutral Thermal
PDB	Project Database
PDS	Planetary Data System
PPI	Planetary Data System, Planetary Plasma Interactions Node
SDVT	Science Data Validation Team

Table 4: Acronyms and Abbreviations	
Acronym	**Definition**
SIS	Software Interface Specification
TBD	To Be Determined
UCLA	University of California, Los Angeles

1.5 Glossary

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

Archive Volume - An Archive Volume is a logical organization of directories and files in which data products are stored.

Catalog Information – High-level descriptive information about a Data Set (e.g., mission description, spacecraft description, instrument description), expressed in Object Description Language (ODL), which is suitable for loading into a PDS catalog.

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

Data Set – A Data Set is a collection of Data Products from a single instrument that have a common data processing level, together with supporting documentation and ancillary files.

Standard Data Product – A Data Product generated in a predefined way using well-understood procedures, processed in "pipeline" fashion. Data Products that are generated in a non-standard way are sometimes called *special Data Products*.

1.6 Content Overview

The Ion and Neutral Mass Spectrometer (INMS) aboard the Cassini spacecraft consists of a closed ion source and an open ion source; various focusing lenses; an electrostatic quadrupole switching lens; a radio frequency quadrupole mass analyzer; two secondary electron multiplier detectors; and the associated supporting electronics and power supply systems. The INMS will be operated in three different modes: a closed source neutral mode (CSN), for the measurement of non-reactive neutrals such as N_2 and CH_4; an open source neutral (OSN) mode, for reactive neutrals such as atomic nitrogen; and an open source ion (OSI) mode, for positive ions with energies less than 100 eV. The primary focus of the INMS investigation is on the composition and structure of Titan's upper atmosphere and its interaction with Saturn's magnetospheric plasma. Note that the INMS 'Closed Source' mode only measures neutral particles so 'neutral' is redundant when referring to this mode. However CSN is used throughout this document so that file-naming conventions are the same number of characters for all modes.

INMS is a complex instrument, and will be taking data continuously throughout the tour phase of the mission (the exception being the release of the Huygens Probe and the associated quiet period, during which most instruments on Cassini will be turned off). This complexity, coupled with tracking the minute changes in the characteristics of the instrument over time, mean calibration data and calibration techniques will be dynamic. For this reason it will be impractical to redeliver data volumes as calibration improves. The solution is to deliver a data set that has scaling factors applied (i.e. converted to engineering units), and provide the calibration data as a

separate ancillary volume. Thus, as calibrations improve, only the reference volume will need to be redistributed.

Each of the three modes of the INMS will produce packets containing total counts per sample. The number of integration periods that are co-added to form a packet depends on the rate at which the instrument is taking data.

INMS data will be divided into three data sets, one containing telemetry packet contents converted from data numbers to engineering units, one containing detector data annotated with instrument state and geometric data, and one containing higher level data produced from the lower level data. The data sets may contain one or more product types, which correspond to collections of related data in files of specific organization. The high level data sets contain one product type for ions and one for neutrals, whilst the low level data set contains one product type for each telemetry packet. The data set identification, CODMAC levels, and product types are enumerated in Table 5.

Table 5: Relationship Between Data Sets and Standard Data Products

Data Set ID	CODMAC Level	Standard Data Product ID	Description
CO-S-INMS-5-DEN-C-V1.0	5	INMS_NEU INMS_ION	Profiles of neutral species densities Ion density spectra
CO-S-INMS-3-L1A-U-V1.0	3	INMS_L1A	Annotated instrument output
CO-S-INMS-2-PKT-U-V1.0	2	INMS_PKT_SCI	Telemetry Packets with contents converted from data numbers to dimensional quantities
		INMS_PKT_HKG	
		INMS_PKT_HMD	
		INMS_PKT_SMD	
		INMS_PKT_OTS	Operational table description

The data set CO-S-INMS-2-PKT-U-V1.0 contains the contents of the INMS telemetry packets, with each variety of packets forming a product type. INMS produces 4 packet types, Science (SCI), Housekeeping (HKG), Science Memory Dumps (SMD), and Housekeeping memory Dumps (HMD). An additional data type, OTS, is included in this data set which contains information describing the operational table set controlling the data collection.

The data set CO-S-INMS-3-L1A-U-V1.0 contains annotated detector signals as a single data type. The data is aggregated from the science and housekeeping telemetry, spacecraft ephemeris and attitude data, Saturnian system ephemeris, and operations table contents. This data is provided as the fundamental data from which to produce higher level products. Besides the data files, this data set includes graphical browse products and a calibration summary valid at the time of volume creation.

The data set CO-S-INMS-5-DEN-C-V1.0 contains neutral and ion densities retrieved from data collected for each targeted encounter for which the INMS instrument pointing was adequate and the instrument was in an appropriate data collection mode. The data is annotated with location and geometric information. The species that may be included are listed in in Table 6 and Table 7.

Table 6: Most Abundant Ion Species in Titan's Ionosphere

Mass Group	Mass Number	Species
Light	1	H^+
	2	H_2^+
	3	H_3^+
Medium	14	N^+, CH_2^+
	15	CH_3^+, NH^+
	16	CH_4^+
	17	CH_5^+
Heavy	27	$C_2H_3^+$
	28	N_2^+, $C_2H_4^+$, $HCNH^+$
	29	N_2H^+, $C_2H_5^+$
Very Heavy	39	$C_3H_3^+$
	41	$C_3H_5^+$, H5+
	51	$C_4H_4^+$
	52	$C_3H_2N^+$
	53	$C_4H_5^+$, $C_5H_5^+$$C_5H_5^+$
	65	$C_5H_5^+$
	67	$C_5H_7^+$
	69	$C_5H_9^+$
	77	$C_6H_5^+$
	79	$C_6H_7^+$, $C_5H_5N^+$
	91	$C_7H_7^+$

Table 7: Expected Neutral Species in Titan's Upper Atmosphere

Mass Number	Closed Source	Open Source Neutral
2	H_2	
3	HD	
4	He	
14		N
15		NH
16	CH_4	CH_4, O
17	$^{13}CH_4$	OH
18	H_2O	H_2O
26	C_2H_2	
27	HCN	HCN
28	N_2, C_2H_4, CO	N_2, C_2H_4, CO
29	$^{15}N^{14}N$, $^{13}C_2H_4$	
30	C_2H_6	
36	(^{36}Ar)	
39		CHCN
44	CO_2, C_3H_8	
50		C_3N
51	CH_3CN, HC_3N	
52	C_2N_2	
74		C_6H_2
76	C_4N_2	
78	C_6H_6	

Table 8 contains a list of targeted flybys for which INMS is currently prime. When INMS is the prime instrument, the spacecraft pointing design was specified by the INMS team to support INMS data collection goals. The inner magnetosphere passes are still being determined in the science planning process, thus this list stops at Rev 46 (where the planning process is at the time this document was written). However, since these types of encounters are typically on the order of 90 minutes to two hours, this will be a relatively small subset of the INMS data.

Table 8: INMS Targeted Flybys			
Target	**FLYBY**	**REV**	**Alt (Km)**
Titan	A	A	1200
Titan	T5	6	951
Titan	T17	28	950
Titan	T18	29	950
Titan	T21	35	950
Titan	T26		
Titan	T27	41	952
Titan	T32	46	950
Titan	T36	50	950
Titan	T37	52	950
Titan	T39	54	952
Titan	T40	55	950
Enceladus	E61	61	TBD
Inner Mag		25	
Inner Mag		26	
Inner Mag		29	
Inner Mag		31	
Inner Mag		34	
Inner Mag		43	
Inner Mag		46	

In addition to the data sets outlined above, INMS will be producing and archiving a reference volume. This volume will contain the documentation that describes the INMS instrument and investigation. It will also contain the detailed calibration report. This report, contained in the CALIBRATION directory is the structured collection of document files, data files, command sequences and programs used to perform the characterizations of the flight and engineering model. Additional engineering model characterization activities are possible. In that event, the calibration report will be extended and the reference volume re-issued.

Table 9 contains estimates of the INMS monthly deliverable data volume, as well as a maximum possible. The L1A volume is computed based on INMS operating at full telemetry rate approximately 3 days per month and at reduced rate for the remainder of the period. Browse product files are negligible in volume compared with the data files.

Table 9: Deliverable Products and Their Approximate Size			
Data Set Identifier / Volume	**Standard Data Product Type**	**Delivery Frequency**	**Estimated Size**
CO-S-INMS-2-PKT-U-V1.0	INMS_PKT_SCI INMS_PKT_HKG INMS_PKT_HMD INMS_PKT_SMD INMS_PKT_OTS	quarterly	tbd tbd tbd tbd tbd
CO-S-INMS-3-L1A-U-V1.0	INMS_L1A	quarterly	3.2GB
CO-S-INMS-5-DEN-C-V1.0	INMS_NEU INMS_ION	quarterly	tbd

1.7 Scope

This specification applies to all archive volumes containing INMS data products for the duration of its mission.

1.8 Applicable Documents

Planetary Science Data Dictionary Document, August 28,2002, Planetary Data System, JPL D-7116, Rev. E.

Planetary Data System Archive Preparation Guide, January 20, 2005, JPL D-31224, Version 0.050120.

Planetary Data System Standards Reference, August 1, 2003, Version 3.6. JPL D-7669, Part 2.

The Cassini Ion and Neutral Mass Spectrometer, To appear in Space Science Review 2003, J. H. Waite et al.

Cassini/Huygens Program Archive Plan for Science Data，PD 699-068, JPL D-15976

1.9 Audience

This specification is useful to those who wish to understand the format and content of the INMS PDS data product archive collection. Typically, these individuals would be software engineers, data analysts, or planetary scientists.

2. ARCHIVE VOLUME GENERATION

2.1 Archive Structure and Identification

PDS data set names shall conform to the following format: CASSINI <target> INMS <data type> <calibration state> DATA V<major version>.<minor version>. For example, version one of the L1A science data set will be named CASSINI S INMS L1A UNCALIBRATED DATA V1.0.

PDS data set identifiers (dsid) will be abbreviated versions of the data set names formed according to the PDS formation rule for the DATA_SET_ID keyword. For example, the dsid for the data set above would be CO-S-INMS-3-L1A-U-V1.0.

Each data set making up the INMS archive is contained in a distinct logical volumes. At the PPI node, each data set is maintained on-line. The volume identifiers consist of the mission and instrument prefix and a volume identification number as follows:

COINMS_Dnnn

where COINMS is the instrument prefix, D indicates the data set to which the volume belongs and nnn is a sequential number assigned to each volume. With electronic distribution, there is only one volume, so the sequential number is fixed at 1. The values for the data set indicator are specified in the Table 10.

Table 10: Volume Identifiers

Data Set ID	Data Set Indicator *D*	Volume Identifier
CO-S-INMS-2-PKT-U-V1.0	0	COINMS_0001
CO-S-INMS-3-L1A-U-V1.0	3	COINMS_3001
CO-S-INMS-5-DEN-C-V1.0	6	COINMS_6001

Data file names are formed from the date and type of the data according to the convention in Table 11. The names of INMS_PKT and INMS_L1A type files, which contain one hour of data contain the hour in the file names. The names of the remaining data types, produced once per day or once per encounter for the NEU and ION data types, have “00” in the hour field of the name. All file names include a version number, which is a sequentially assigned number, beginning at 01. The version number is incremented when the contents or format of the file is changed. The relationship between the various identifiers is illustrated in Table 12.

Table 11: Data File Naming Convention
Filename format: yyyydddhh_ttt_ vv.CSV

Identifier	Description	Options
yyyydddhh	Start time of data file	yyy - Year ddd - Day of Year hh - Hour
ttt	Data type	L1A - Science data annotated with ancillary data NEU - Neutral species density profiles ION – Ion species density profiles SCI - Science Data Packet contents, scaled HKG - Housekeeping Data Packet contents, scaled HMD - Housekeeping Memory Dump Packet Contents, scaled SMD - Science Memory Dump Packet Contents, scaled OTS - Operational Table Descriptions
vv	Version number of data	01, 02, ..., etc.

Each archive volume has the same general structure, consisting of a set of fixed top level directories, INDEX, DOCUMENT, CATALOG, CALIB, DATA, BROWSE and optionally EXTRAS, the contents of which will be described in detail below. The BROWSE directory is only part of the CO-S-INMS-3-L1A-U-V1.0 data set. The EXTRAS directory contains files that are helpful but not required for interpretation of the archived data.

The relationship between the data set, standard data product identifiers and file names are illustrated in Table 12. The directory structure for each data set are shown in the Appendixes.

Table 12: Relationship Between Data Sets, Standard Data Product Types, and File Names

Data Set ID	CODMAC Level	Standard Data Product ID	Example File Name
CO-S-INMS-5-DEN-C-V1.0	5	INMS_NEU	200430000_NEU_01.CSV
		INMS_ION	201230000_ION_01.CSV
CO-S-INMS-3-L1A-U-V1.0	3	INMS_L1A	200430015_L1A_01.CSV
CO-S-INMS-2-PKT-U-V1.0	2	INMS_PKT_SCI	200430000_SCI_01.CSV
		INMS_PKT_HKG	200430000_HKG_01.CSV
		INMS_PKT_OTS	200430000_OTS_01.CSV
		INMS_PKT_SMD	200430000_SMD_01.CSV
		INMS_PKT_HMD	200430000_HMD_01.CSV

2.2 Data Production and Transfer Methods

The INMS standard product archive collection is produced by the INMS instrument team in cooperation with the PDS Planetary Plasma Interactions (PPI) Node at the University of California, Los Angeles (UCLA). The INMS team is funded by NASA through the Cassini Project office and the PPI activities are funded by the NASA Planetary Data System.

The INMS team produces the individual data files and the associated PDS labels for each of the standard data products defined in section 1.6 above. Data files will all be comma-separated value, ASCII files containing all data of the appropriate type for the time interval contained in the data product. Data products will be compressed (Gzipped) and transferred via secure FTP to the PPI node. Each data transfer is logged in the Cassini Archive Tracking System, CATS. Upon notification of the data transfer provided by the CATS, the PPI node decompresses the transfer and compares its contents against the CATS transfer information. Each data file is validated against the MD5 checksum contained the corresponding detached label. The PPI node will post a positive or negative acknowledgement of the data receipt on CATS. If the acknowledgement is positive, no further action is required on the part of INMS. If the acknowledgement is negative, the transfer is repeated.

2.3 Archive Volume Creation

PPI collects the data files and labels provided by the INMS team onto archive volumes. Each archive volume contains all INMS data available for the time interval covered by the archive volume. Once all of the data files, labels, and ancillary data files are organized onto an archive

volume, PPI adds all of the PDS required files (AAREADME, INDEX, ERRATA, etc.) and produces the physical media.

2.4 Volume Validation Methods

Validation of the INMS data archive is completed in two phases. The first phase is performed by the PPI node and consists of reviewing a sample data set for compliance with the PDS standards. The INMS team will submit a set of data files following the procedure of section 2.2 above. Upon receipt, the PPI node will confirm the structure of the files and labels. Once the sample data is validated, PPI will develop software to generate subsequent data volumes in an automated fashion.

The second phase of the validation consists of a peer review to ensure usability and completeness. The peer review panel will consist of members of the instrument team, the PPI and Central Nodes of the PDS, and at least two outside scientists actively working in the field of mass spectrometry or planetary atmospheres. The PDS personnel will be responsible for validating that the archive volume(s) are fully compliant with PDS standards. The instrument team and outside science reviewers will be responsible for verifying the content of the data set, the completeness of the documentation, and the usability of the data in its archive format. Any deficiencies in the archive volume will be recorded as liens against the product by the review panel. After all liens placed against the product or the product generation software are resolved, automated production and validation can begin.

Once automated production begins, the data file content will be spot checked by members of the INMS team. Browse products corresponding to the L1A product will be produced routinely and examined by members of the INMS team. In addition, the data will be actively used by team members to perform their analysis. Any discrepancies in the data noted during these activities will be investigated. If the discrepancy is a data error, the response will depend on the source of the error. If the error is in the software producing the data product, the error will be corrected and the data products affected will be reproduced. If there is a correctable error in a data file, the file will be replaced. If an error in a data file is uncorrectable, the error will be described in the cumulative errata file included on each volume in the volume set. The structure of data files and labels will be spot checked by the PPI node for compliance with PDS standards and this SIS.

3. ARCHIVE VOLUME CONTENTS

This section describes the contents of the INMS standard product archive collection volumes, including the file names, file contents, file types, and organizations responsible for providing the files. The complete directory structures are shown in Appendix A, B, and C. All directories and ancillary files described herein appear on each INMS archive volume, except where noted.

3.1 Root Directory Contents

The following files are contained in the root directory, and are produced by the PPI Node at UCLA. All of these files are required by the PDS Archive Volume organization standards.

Table 13: Root Directory Contents

File Name	File Contents	Provided By

Table 13: Root Directory Contents		
File Name	**File Contents**	**Provided By**
AAREADME.TXT	This file completely describes the Volume organization and contents (PDS label attached).	PPI
ERRATA.TXT	A cumulative listing of comments and updates concerning all INMS Standard Data Products on all INMS Volumes in the Volume set published to date.	PPI
VOLDESC.CAT	A description of the contents of this Volume in a PDS format readable by both humans and computers.	PPI

3.2 INDEX Directory Contents

The following files are contained in the index directory and are produced by the PDS PPI Node. The INDEX.TAB file contains a listing of all data products on the archive volume. The index and index information (INDXINFO.TXT) files are required by the PDS volume standards. The index tables include both required and optional columns. The cumulative index file is also a PDS requirement; however, this file is not reproduced on each data volume. An online and web accessible cumulative index file is maintained at the PPI Node while archive volumes are being produced. Only the last archive volume in the volume series will contain a cumulative index file.

Table 14: Index Directory Contents		
File Name	**File Contents**	**Provided By**
INDXINFO.TXT	A description of the contents of this directory	PPI
INDEX.TAB	A table listing all INMS Data Products on this Volume	PPI
INDEX.LBL	A PDS detached label that describes INDEX.TAB	PPI

3.3 DOCUMENT Directory Contents

The document directory contains documentation that is considered to be either necessary or simply useful for users to understand the archive data set. These documents are not necessarily appropriate for inclusion in the PDS catalog. Documents may be included in multiple forms (ASCII, PDF, MS Word, HTML with image file pointers, etc.). PDS standards require that any documentation deemed required for use of the data be available in some ASCII format. Clean HTML is acceptable as ASCII formats in addition to plain text. The following files are contained in the DOCUMENT directory and are produced or collected by the PPI Node.

Table 15: Document Directory Contents		
File Name	**File Contents**	**Provided By**
DOCINFO.TXT	A description of the contents of this directory	PPI
VOLSIS.DOC	The Archive Volume SIS (this document) in Microsoft Word format	INMS, PPI
VOLSIS.ASC	The Archive Volume SIS (this document) in ASCII format	INMS, PPI
VOLSIS.LBL	A PDS detached label that describes VOLSIS.ASC, VOLSIS.HTM and VOLSIS.DOC.	PPI
Other Documents	Additional documents describing data processing, calibration etc.	INMS
Other Document labels	Detached PDS labels for any additional documents	PPI

3.4 CATALOG Directory Contents

The completed PDS catalog files in the catalog directory provide a top-level understanding of the Cassini/INMS mission and its data products. The data set catalog files (e.g. CO_INMS_PKT_DS.CAT) will be provided by the INMS team, and the CATINFO.TXT by the PPI Node.

Table 16: Catalog Directory Contents		
File Name	**File Contents**	**Provided By**
CATINFO.TXT	A description of the contents of this directory	PPI
CO_INMS_PKT_DS.CAT *or* CO_INMS_L1A_DS.CAT *or* CO_INMS_NEU_DS.CAT	PDS Data Set catalog description of appropriate to the data set	INMS
CO_INSTHOST.CAT	PDS instrument host (spacecraft) catalog description of the Cassini spacecraft	Cassini Project
CO_INMS_INST.CAT	PDS instrument catalog description of the INMS instrument	INMS
CASSINI_MISSION.CAT	PDS mission catalog description of the Cassini mission	Cassini Project
CO_INMS_PERSON.CAT	PDS personnel catalog description of INMS Team members and other persons involved with generation of INMS Data Products	INMS
CO_INMS_REF.CAT	INMS-related references mentioned in other *.CAT files Additional bibliographic references, as appropriated	INMS
PRJREF.CAT	Cassini-relative references mentioned in other *.CAT files.	Cassini Project

3.5 CALIB Directory Contents and Naming Conventions

The calibration directory, included in the CO-S-INMS-3-L1A-U-V1.0 data set only, contains one or more spreadsheets of instrument calibration data. An additional file will be added when the instrument characteristics have either changed or been more precisely determined. The files

will be named according to their time range of applicability. For example, if it is determined that the calibration after 2007-030 is sufficiently changed, a file incorporating that date in its name will be added. The naming convention is defined in Table 17, below.

Detailed documentation of the preflight characterization is contained in the EXTRAS directory.

Table 17: Calibration Summary File Naming Convention
Filename format: yyyyddd_CAL_ vv.CSV

Identifier	Description	Options
yyyyddd	Date of validity	yyy - Year ddd - Day of Year
vv	Version number of data	01, 02, ..., etc.

3.5.1 Required Files

The calibration directory contains a file named CALINFO.TXT that is an ASCII text description of the CALIB directory contents. The calibration summary files will be described by detached PDS labels. The label files will have the same root name as the calibration file that they describe with the suffix ".LBL" replacing the ".CSV" suffix.

3.5.2 CALIB Directory Contents

The calibration data is organized in a flat directory structure, with the CALIB directory containing all of the calibration summary files and their labels.

Table 18:Calibration Summary Directory Contents

File Name	File Contents	Provided By
CALINFO.TXT	Brief description of directory contents and naming conventions.	PPI
CAL.CSV	Calibration summary file.	INMS
CAL.LBL	PDS label for CAL file of same base name.	INMS

3.6 DATA (Standard Products) Directory Contents and Naming Conventions

The data directories on each volume contain the actual data products produced by the INMS team. The CO-S-INMS-2-PKT-U-V1.0 archive volume will have SCI, HKG, OTS, EVT, SMD, and HMD files in daily subdirectories. The CO-S-INMS-3-L1A-U-V1.0 archive volume will have L1A files in daily subdirectories. The CO-S-INMS-3-L1A-U-V1.0 archive volume contains the L2 density files in subdirectories by encounter. (see 3.6.2. for details description of this directory structure).

3.6.1 Required Files

Every file in the Data path of an Archive Volume must be described by a PDS label. All labels will be detached, having the same root name as the file they describe with the suffix

".LBL". In directories where there are multiple data files with the same internal table structure, the table column description is included in a single format file (.FMT) that is referenced by a pointer within each PDS label file. This prevents the needless repetition of information that is not changing within the PDS label files.

3.6.2 DATA Directory Contents

The data directory for the CO-S-INMS-2-PKT-U-V1.0 and the The CO-S-INMS-3-L1A-U-V1.0 data sets contains a separate subdirectory for each day. The daily subdirectories are grouped by year into yearly directories. The structure may be seen in Appendix A. The yearly directories will be named for the year, 2004, 2005, and so forth. The daily subdirectories will be named with the ordinal day-of-year, 001, 002,...366. There may be more than one SCI, or L1A data file in each subdirectory, depending on what events take place on a given day. For HKG, OTS, SMD and HMD only one file will be produced per day.

The data directory for the CO-S-INMS-3-L1A-U-V1.0 data set contains a separate subdirectory for each targeted encounter. The encounter directories are grouped into directories by target. Generally there will be one INMS_ION and one INMS_NEU data file in each encounter file.

Table 19: Daily Data Directory Contents

File Name	File Contents	Provided By
yyyydddhh_*ttt*_vv.CSV	Data file.	INMS
yyyydddhh_*ttt*_vv.LBL	PDS label for data files of same base name.	INMS
*ttt*_STRUCT_VV.FMT	PDS format file containing the data file structure portion of the PDS label for all of the INMS_L1A and INMS_SCI data files.	INMS

ttt is replaced with L1A on the CO-S-INMS-3-L1A-U-V1.0 data set volumes
SCI,HKG, OTS, SMD, and HMD on the CO-S-INMS-2-PKT-U-V1.0 data set volumes
NEU and ION on the CO-S-INMS-5-DEN-C-V1.0 data set volumes
There are no structure files for standard data products INMS_HKG, INMS_OTS, INMS_SMD, or INMS_HMD

3.7 BROWSE Directory Contents and Naming Conventions

The browse directory contains images of INMS summary data and is included only on the CO-S-INMS-3-L1A-U-V1.0 data set volume. Two type of images are included, mass-time spectra and time series data. Each image spans six hours beginning at 0h, 6h, 12h, and 18h. (examples to be added). The image files are all portable network graphics files. The files are named in accordance with the convention in Table 20.

Table 20: Browse Product File Naming Convention ***Filename format: yyyydddhh_ttt_ vv.PNG***		
Identifier	**Description**	**Options**
yyyydddhh	Start date file	yyy - Year ddd - Day of Year hh - Hour of Day
ttt	Plot type	SPECTRA - mass-time spectra LINE - mass time series
vv	Version number of data	01, 02, ..., etc.

3.7.1 Required Files

The browse directory contains a file named BROWINFO.TXT which contains a description of the directory contents in ASCII text. Every file in the browse path is described by a PDS label. All labels will be detached, having the same root name as the file they describe with the suffix '.LBL' replacing the suffix of the file name.

3.7.2 BROWSE Directory Contents

The browse directory contains a separated subdirectory for each day. The daily subdirectories are grouped by year into yearly directories. The structure may be seen in Appendix A. The yearly directories will be named for the year, 2004, 2005, and so forth. The daily subdirectories will be named with the ordinal day-of-year, 001, 002,...366. Each daily directory contains eight files, four mass-time spectra and four mass time series. In addition there will be a brief text file (INFO.TXT) that describes the directory contents.

Table 21: Daily Browse Product Directory Contents		
File Name	**File Contents**	**Provided By**
BROWINFO.TXT	Brief description of directory contents and naming conventions.	PPI
yyyydddhh_SPECTRA_vv.PNG	Mass-time spectra browse plots	INMS
yyyydddhh_SPECTRA_vv*.LBL	PDS label for SPECTRA plot file of same base name.	PPI
yyyydddhh_LINE_vv.PNG	Time series browse plots	INMS
yyyydddhh_LINE_vv.LBL	PDS label for LINE plot file of same base name	PPI

3.8 EXTRAS Directory Contents

The EXTRAS directory contains files that are helpful, but are not required to interpret the INMS data. Files in the EXTRAS directory are exempt from labeling requirements. An EXTRAS directory is included in the CO-S-INMS-3-L1A-U-V1.0 archive. Subdirectories are used to organize the items into groups of related files. The EXTRAS directory will contain two subdirectories, SOFTWARE and CALREPORT. To avoid the requirement of redistributing all

physical media data volumes in the event that the EXTRAS contents changes, this directory will be present on only the first physical volume COINMS_3000, and a note to that effect will be placed in the AAREADME file on all physical volumes.

3.8.1 SOFTWARE Directory Contents

The SOFTWARE directory contains a library of IDL routines that may be used to read, manipulate and display the contents of the L1A data files. In addition to the IDL source code files, the directory will contain a user's guide and an HTML help file.

3.8.2 CALREPORT Directory Contents

The calibration report directory in the EXTRAS directory contains the complete report of the pre-launch instrument characterization. The report is in the form of a structured series of files containing data from one characterization test. These files are the source for the initial calibration summary file included in the archive volume. The organization of this directory is shown in Appendix C.

4. ARCHIVE VOLUME FORMAT

This section describes the format of the INMS standard product archive volumes. Data that comprise the INMS standard product archives will be formatted in accordance with Planetary Data System specifications.

4.1 Disk Format

Disk formats for the archive volumes will conform to the PDS standard for the applicable media. At present, the plan is to archive INMS data on as a single electronic volume.

4.2 File Formats

The following section describes file formats for the kinds of files contained on Archive Volumes. For more information, see the PDS Archive Preparation Guide.

4.2.1 Document File Formats

Document files with the .TXT suffix exist in all directories. They are ASCII files with attached PDS labels. All document files contain variable-length, 80-byte maximum records, with a carriage return character (ASCII 13) in the 79th byte and a line feed character (ASCII 10) in the 80th byte. This allows the files to be read by the MacOS, DOS, Windows, UNIX, OS2, and VMS operating systems.

However, some of the documents in the reference volume contain formatting and figures that cannot be rendered as pure ASCII text. These documents will be provided in formats that support graphics, such as HTML, MS Word, PDF, etc. The PDS requirement that all documentation critical to the understanding of the data set be provided in ASCII text form will be met by the inclusion of CLEAN HTML formatted documents.

4.2.2 Catalog File Formats

Catalog files (suffix .CAT) exist in the Root and Catalog directories. They are formatted in an object-oriented structure consisting of sets of 'keyword = value' declarations. All files are

ASCII and conform to the same structure standards (line length, line terminator) as the PDS labels described in the next section.

4.2.3 PDS Label File Formats

All data files in the INMS Standard Product Archive Collection have PDS labels. INMS is producing ASCII comma separated value files for all products. Each file will have a detached label, whose name is identical to the data file name with the .CSV suffix replaced by .LBL.

A PDS label provides descriptive information about the associated file. The PDS label is an object-oriented structure consisting of sets of 'keyword = value' declarations.

All detached labels contain 80-byte fixed-length records, with a carriage return character (ASCII 13) in the 79th byte and a line feed character (ASCII 10) in the 80th byte. This allows the files to be read by the MacOS, DOS, Windows, UNIX, OS2, and VMS operating systems.

4.2.4 Data File Formats – Comma Separated Value Files

Delimited field, ASCII data files (.CSV suffix) exist in the DATA directories. These files are formatted for direct reading into many database management systems on various computers. In the INMS application of the delimited field format, fields are separated by commas. Records vary in length in bytes but will have a fixed number of fields. Missing data are represented by empty fields. All fields are described by detached PDS labels.

4.3 General Data Product Format

All INMS data products are CSV files that contain a series of homogenous records. Records are delimited by the end-of-line characters, the carriage return character (ASCII 13) followed by the line feed character (ASCII 10). Each file contains one or more lines of column headers. The starting location of the data is indicated in the label by the spreadsheet pointer. The column headers are the same as the field name in the tables below, additional header rows contain the units and strings to use as axis labels in plots. Blank fields indicate that the field is not applicable in the context of the record, the data is not available, is out of nominal range, or is otherwise not suitable for archiving. The following sections describe the content and structure of each of the standard data products within the INMS data sets, as described in Table 12 in Section 2.1.

4.3.1 INMS SCI Data Product Formats

Table 22, below, describes the contents and ranges of the SCI data files. These files contain the contents of the science data packets, converted to dimensional quantities. Each record consists of 9 header items followed by the contents of the telemetry packet.

Table 22: SCI Data File Contents and Structure

Field Name	Type	Units	Range
OriginalPacketID	integer		
EventID	integer		
PacketID	integer		
AssocSciPacketID	integer		
SCLKTime	string		

Table 22: SCI Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
SCLKRaw	real		
ERTTime	string		
Processedtime	string		
Mode	string		
Valid	integer		0 ≤ x ≤ 1
MiniPktID	integer		0 ≤ x ≤ 65535
ElapsedSeqTime	integer		0 ≤ x ≤ 65535
ScanIndex	integer		0 ≤ x ≤ 31
SeqTable	integer		0 ≤ x ≤ 31
CycleNum	integer		0 ≤ x ≤ 63
IL1DAC	integer		0 ≤ x ≤ 255
C6DAC	integer		0 ≤ x ≤ 15
ThPresDAC	integer		0 ≤ x ≤ 15
CF1DAC	integer		0 ≤ x ≤ 15
BADAC	integer		0 ≤ x ≤ 15
DT1DAC	integer		0 ≤ x ≤ 15
DT2DAC	integer		0 ≤ x ≤ 15
EM1DAC	integer		0 ≤ x ≤ 255
EM2DAC	integer		0 ≤ x ≤ 255
TmModeIndex	integer		0 ≤ x ≤ 31
MassTable	integer		0 ≤ x ≤ 2047
IP1C1	real		0 ≤ x ≤ 33711902.01
IP1C2	real		0 ≤ x ≤ 33711902.01
IP2C1	real		0 ≤ x ≤ 33711902.01
IP2C2	real		0 ≤ x ≤ 33711902.01
• | • | •	• • •	• • •	0 ≤ x ≤ 33711902.01
IP67C1	real		0 ≤ x ≤ 33711902.01
IP67C2	real		0 ≤ x ≤ 33711902.01
IP68C1	real		0 ≤ x ≤ 33711902.01
IP68C2	real		0 ≤ x ≤ 33711902.01
Spare	integer		0 ≤ x ≤ 65536
Loop	integer		0, 1
Sthi	integer		0, 1
DCONState	integer		0 ≤ x ≤ 63

Table 22: SCI Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
CycleIndex	integer		0 ≤ x ≤ 255
SequenceRecord	string		
CycleRecord	string		
FilCmd4On	integer		0, 1
FilCmd3On	integer		0, 1
FilCmd2On	integer		0, 1
Fil4Cmd1On	integer		0, 1
Fil6On	integer		0, 1
Fil4On	integer		0, 1
Fil3On	integer		0, 1
Fil2On	integer		0, 1
Fil1On	integer		0, 1
FilCollision	integer		0, 1
FilEmissAdjust	integer		0, 1
USeqFilError	integer		0, 1
Spare	integer		0 ≤ x ≤ 511
SciRTICounter	integer		0 ≤ x ≤ 65535
SciDTCounter	integer		0 ≤ x ≤ 65535
SciSTMCounter	integer		0 ≤ x ≤ 65535
CPUIdleCounter	integer		0 ≤ x ≤ 15
Disc0Reset	integer		0, 1
AllSysGo	integer		0, 1
AllSysGoLatched	integer		0, 1
ExcNoHandler	integer		0, 1
SafeMode	integer		0, 1
ForcedSleep	integer		0, 1
BIU_Auto_Init	integer		0 ≤ x ≤ 7
GSETest	integer		0, 1
SystemInitialized	integer		0, 1
SystemConfigured	integer		0, 1
INMSBitFail	integer		0, 1
TMBuffOverflow	integer		0, 1
AlfBoot	integer		0, 1
AlfError	integer		0, 1
BIUMemError	integer		0, 1
ODBfrOverflow	integer		0, 1

Table 22: SCI Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
USeqoOfflinew	integer		0, 1
USeqiOffline	integer		0, 1
USeqError	integer		0, 1
1750ME	integer		0, 1
AmuxError	integer		0, 1
CDSoOffline	integer		0, 1
CDSiOnline	integer		0, 1
CDSError	integer		0, 1
RTEError	integer		0, 1
bSpare	integer		0, 1
Imon1	real	A	0.087772 ≤ x ≤ 1.646842
BACollector	real	V	-0.04 ≤ x ≤ 5.06
Imon2	real	A	0.087772 ≤ x ≤ 1.646842
BACurrent	real	A RMS	-0.010828 ≤ x ≤ 1.369742
BAEmission	real	µA	103.302002 ≤ x ≤ 193.595596
RFAGC	real	V	-0.04 ≤ x ≤ 5.06
MultAna1	real	µA	-0.08 ≤ x ≤ 10.12
MultAna2	real	µA	0.258 ≤ x ≤ 1.518
Imon3	real	A	0.087772 ≤ x ≤ 1.646842
ThermPressInt	real	V	-0.04 ≤ x ≤ 5.06
1Emission	real	µA	5.8812 ≤ x ≤ 25.6542
3Emission	real	µA	-0.2022 ≤ x ≤ 25.5783
EM1Current	real	µA	-0.30072 ≤ x ≤ 38.04108
EM2Current	real	µA	7.518 ≤ x ≤ 38.04108
CmdsRec	integer		0 ≤ x ≤ 65535
CmdsRej	integer		0 ≤ x ≤ 65535
AlfsRec	integer		0 ≤ x ≤ 65535
AlfsRej	integer		0 ≤ x ≤ 65535
CmdSerNo1	integer		0 ≤ x ≤ 255
Time1	integer		0 ≤ x ≤ 16777215
CmdSerNo2	integer		0 ≤ x ≤ 255
Time2	integer		0 ≤ x ≤ 16777215
CmdSerNo2	integer		0 ≤ x ≤ 255
Time3	integer		0 ≤ x ≤ 16777215
CRC	integer		n/a

4.3.2 INMS L1A Data Product Formats

The L1A files contain the annotated science data. These files contain data abstracted from the science and housekeeping packets along with derived ancillary quantities. The data contained in these files is the basic data from which higher order products are derived. The structure file, included as Appendix D, further describes these records.

4.3.3 INMS HKG Data Product Formats

The HKG files contain the complete contents of the housekeeping telemetry packets, converted to dimensional quantities. Each record consists of 9 header items followed by the contents of the telemetry packet. The structure file, included as Appendix E, further describes these records.

4.3.4 INMS NEU Data Products Format

The NEU files contain the neutral species densities retrieved from the INMS measurements in the CSN mode. The retrieval is performed using the method described in Magee, xxx. Each record consists of …. The structure file, included as Appendix F, further describes these records.

4.3.5 INMS ION Data Products Format

The ION files contain the ion species densities retrieved from the INMS measurements in the OSI mode. The retrieval is performed using the method described in Mandt, xxx. Each record consists of densities and the estimated error in the density at each mass from 1 to 99. Additional items in the record include time, location and data quality. The structure file, included as Appendix G, further describes these records.

4.3.6 INMS OTS Data Product Formats

The OTS is the Operations Table Set that was in instrument memory when the data was taken. Table 23 below describes the contents of the OTS data files. Each row in the file contains the description of a table set and its period of use. If more than one table set was in use during a day, this file will have multiple records.

Table 23: OTS Data File Contents and Structure

Field Name	Type
TABLESETID	Integer
OPSTABLESTYPEID	Integer
CREATEID	Integer
CREATEDATE	Date/Time
UPDATEID	Integer
UPDATEDATE	Date/Time
INSTRUMENT	String
ACTIVE	Integer

Table 23: OTS Data File Contents and Structure	
Field Name	**Type**
ACTIVEDATE	Date/Time
INACTIVEDATE	Date/Time
LOCKED	Integer
TITLE	String
DESCRIPTION	String

4.3.7 INMS SMD Data Product Formats

The SMD files contain the complete contents of the science memory dump telemetry packets. The INMS team uses this file to verify the state of the instrument. Table 24 below describes the contents and ranges of the SMD data files. These files contain the contents of the memory dump telemetry packets, converted to dimensional quantities, where appropriate. Each record consists of 9 header items followed by the contents of the telemetry packet.

Table 24: SMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
OriginalPacketID	integer		
EventID	integer		
PacketID	integer		
SCLKTime	string		
SCLKRaw	real		
ERTTime	string		
Processedtime	string		
Mode	string		
Valid	integer		0, 1
MiniPacketID	integer		0 ≤ x ≤ 65535
DumpSource	integer		0 ≤ x ≤ 7
NumberofWords	integer		0 ≤ x ≤ 255
DumpAddress	string		0 ≤ x ≤ 65535
IL1DAC	integer		0 ≤ x ≤ 255
C6DAC	integer		0 ≤ x ≤ 15
ThPressDAC	integer		0 ≤ x ≤ 15
CF1DAC	integer		0 ≤ x ≤ 15
BADAC	integer		0 ≤ x ≤ 15
DT1DAC	integer		0 ≤ x ≤ 15
DT2DAC	integer		0 ≤ x ≤ 15

Table 24: SMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
EM1DAC	integer		0 ≤ x ≤ 255
EM2DAC	integer		0 ≤ x ≤ 255
TMModeIndex	integer		0 ≤ x ≤ 31
MassTable	integer		0 ≤ x ≤ 2047
Word0	integer		0 ≤ x ≤ 0xFFFF
• •	• •		0 ≤ x ≤ 0xFFFF
Word170	integer		0 ≤ x ≤ 0xFFFF
WordSpare	string		
CPUIdleCounter	integer		0 ≤ x ≤ 15
Disc0Reset	integer		0, 1
AllSysGo	integer		0, 1
AllSysGoLatched	integer		0, 1
ExcNoHandler	integer		0, 1
Safemode	integer		0, 1
ForcedSleep	integer		0, 1
BIU_Auto_Init	integer		0, 1
GSETest	integer		0, 1
SystemInitialized	integer		0, 1
SystemConfigured	integer		0, 1
INMSBitFail	integer		0, 1
TMBuffOverflow	integer		0, 1
AlfBoot	integer		0, 1
AlfError	integer		0, 1
BIUMemError	integer		0, 1
ODBfrOverflow	integer		0, 1
USeqoOffline	integer		0, 1
USeqiOffline	integer		0, 1
USeqError	integer		0, 1
1750ME	integer		0, 1
AmuxError	integer		0, 1
CDSoOffline	integer		0, 1
CDSiOnline	integer		0, 1
CDSError	integer		0, 1
RTEError	integer		0, 1
Spare	integer		0, 1

Table 24: SMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
Imon1	real	A	0.087772 ≤ x ≤ 1.646842
BaCollector	real	V	-0.04 ≤ x ≤ 5.06
Imon2	real	A	0.087772 ≤ x ≤ 1.646842
BaCurrent	real	A RMS	-0.010828 ≤ x ≤ 1.369742
BaErrission	real	µA	103.302002 ≤ x ≤ 193.595596
RFAGC	real	V	-0.04 ≤ x ≤ 5.06
MultAna1	real	µA	-0.08 ≤ x ≤ 10.12
MultAnal2	real	µA	0.258 ≤ x ≤ 1.518
Imon3	real	A	0.087772 ≤ x ≤ 1.646842
ThermPressInt	real	V	-0.04 ≤ x ≤ 5.06
1Emission	real	µA	5.8812 ≤ x ≤ 25.6542
3Emission	real	µA	-0.2022 ≤ x ≤ 25.5783
EM1Current	real	µA	-0.30072 ≤ x ≤ 38.04108
EM2Current	real	µA	7.518 ≤ x ≤ 38.04108
CmdsRec	integer		0 ≤ x ≤ 65535
CmdsRej	integer		0 ≤ x ≤ 65535
AlfsRec	integer		0 ≤ x ≤ 65535
AlfsRej	integer		0 ≤ x ≤ 65535
ConfigNum	integer		0 ≤ x ≤ 255
Time1	integer		0 ≤ x ≤ 16777215
CmdSerNo2	integer		0 ≤ x ≤ 255
Time2	integer		0 ≤ x ≤ 16777215
CmdSerNo3	integer		0 ≤ x ≤ 255
Time3	integer		0 ≤ x ≤ 16777215
CRC			n/a

4.3.8 INMS HMD Data Product Formats

The HMD files contain the complete contents of the housekeeping memory dump telemetry packets. As with the SMD the INMS team uses this file to verify the state of the instrument. Table 25 below describes the contents and ranges of the HMD data files. These files contain the contents of the housekeeping memory dump packets, converted to dimensional quantities, where appropriate. Each record consists of 9 header items followed by the contents of the telemetry packet.

Table 25 :HMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
OriginalPacketID	integer		

Table 25 :HMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
EventID	integer		
PacketID	integer		
SCLKTime	string		
SCLKRaw	real		
ERTTime	string		
Processedtime	string		
Mode	string		
Valid	boolean		
InstMode	integer		0-7
SequenceTable	integer		0-31
CycleIndex	integer		0, 15
ScanIndex	integer		0, 15
ElapsedTime	integer	s	0-65535
CycleTable	integer		0-63
Spare	integer		n/a
MemoryType	integer		0-7
NumberofWords	integer		(1-32)
StartAddress	integer		0-65535
TCReceived	integer		0-255
BIU_Bus_Fault	integer		0-255
Machine_Error	integer		0, 15
TCRejected	integer		0, 15
InstTMMode	integer		0-255
BIUSpare	integer		0-3
TGORDT	boolean		0, 1
AlfOverrideInhibit	boolean		0, 1
AlfBootEnable	boolean		0-255
DefSciEnable	boolean		0-3
BIUSleep	boolean		0, 1
BIUPORD0	boolean		0, 1
HKFull	boolean		0, 1
HKSSysF	boolean		0, 1
HKMSGError	boolean		0, 1
TMSCError	boolean		0, 1
StTblError	boolean		0, 1
AncBCError	boolean		0, 1

Table 25 :HMD Data File Contents and Structure			
Field Name	**Type**	**Units**	**Range**
BIUSpare2	boolean		0, 1
RTIsFail	boolean		0, 1
Fil1ON	boolean		0, 1
Fil2ON	boolean		0, 1
Fil3ON	boolean		0, 1
Fil4ON	boolean		0, 1
DconSpare1	boolean		0, 1
Fil6ON	boolean		0, 1
DconSpare2	integer		0-3
BIUWDX	boolean		0, 1
BIUFT	boolean		0, 1
FCFT	boolean		0, 1
FCTgo	boolean		0, 1
FCIllad	boolean		0, 1
FCNPU	boolean		0, 1
FCSuren	boolean		0-3
BIUDTsLoaded	boolean		0, 1
Word0	integer		0 ≤ x ≤ 0xFFFF
• • •	• • •		0 ≤ x ≤ 0xFFFF
Word31	integer		0 ≤ x ≤ 0xFFFF
TgoDetect	boolean		0, 1
BIUResetOcc	boolean		0, 1
ICError	boolean		0, 1
TGOToggle	boolean		0, 1
SubmoduleID	integer		0, 15
TrapFlag	integer		0-3
ModuleID	integer		0-63
CRC			n/a

APPENDIX A: DIRECTORY STRUCTURE FOR VOLUMES OF THE CO-S-INMS-3-L1A-U-V1.0 DATA SET

```
+-INDEX ----+---INDXINFO.TXT
|           +---INDEX.TAB
|           \---INDEX.LBL
|
+-DOCUMENT--+
|           +---DOCINFO.TXT
|           +---VOLSIS.DOC
|           +---VOLSIS.ASC
|           +---VOLSIS.LBL
|           \---additional documentation files and labels
|
+-CATALOG --+---CATINFO.TXT
|           +---CO_INMS_L1A_DS.CAT
|           +---CO_INSTHOST.CAT
|           +---CO_INMS_INST.CAT
|           +---CASSINI_MISSION.CAT
|           +---CO_INMS_PERSION.CAT
|           \---CO_INMS_REF.CAT
|
+-CALIB-----+---yyyyddd_CAL_vv.CSV
|           \---yyyyddd_CAL_vv.CSV
|
+-DATA-------+----yyyy----+---ddd-----+---yyyyddd00_L1A_vv.CSV
|           |           |           +---yyyyddd01_L1A_vv.CSV
|           |           |           +---yyyyddd02_L1A_vv.CSV
|           |           |           +---yyyyddd03_L1A_vv.CSV
|           |           |           +---up to 20 additional L1A files
|           |           |           +---yyyyddd00_L1A_vv.LBL
|           |           |           +---yyyyddd01_L1A_vv.LBL
|           |           |           +---yyyyddd02_L1A_vv.LBL
|           |           |           +---yyyyddd03_L1A_vv.LBL
|           |           |           +---up to 20 additional L1A labels
|           |           |           +---L1A_STRUCT_vv.FMT
|           |           +---ddd-----+
|           \----yyyy---+---ddd-----+
|
+-BROWSE----+----yyyy---+---ddd-----+---yyyddd00_SPECTRA_vv.PNG
|           |           |           +---yyyddd00_SPECTRA_vv.LBL
|           |           |           +---yyyddd00_LINE_vv.PNG
|           |           |           +---yyyddd00_LINE_vv.LBL
|           |           |           +---up to 5 more browse product sets
|           |           +---ddd-----+
|           \----yyyy---+---ddd-----+
|
\-EXTRAS----+--SOFTWARE-+---INFO.TXT
            |           +---DISCLAMER.TXT
            |           +---INMS_*.PRO    idl v6.1 source code files
            |           +---SPRL_*.PRO    idl v6.1 source code files
            |           +---USERGUIDE.DOC user's guide to routines
            |           \---INMS_ANALYSIS_HELP.HTL    online help
            |
            \-CALREPORT--> see APENDIX C
```

5. APPENDIX A: DIRECTORY STRUCTURE FOR VOLUMES OF THE CO-S-INMS-5-DEN-C-V1.0 DATA SET

```
+-INDEX ----+---INDXINFO.TXT
|           +---INDEX.TAB
|           \---INDEX.LBL
|
+-DOCUMENT--+
|           +---DOCINFO.TXT
|           +---VOLSIS.DOC
|           +---VOLSIS.ASC
|           +---VOLSIS.LBL
|           \---additional documentation files and labels
|
+-CATALOG --+---CATINFO.TXT
|           +---CO_INMS_L1A_DS.CAT
|           +---CO_INSTHOST.CAT
|           +---CO_INMS_INST.CAT
|           +---CASSINI_MISSION.CAT
|           +---CO_INMS_PERSION.CAT
|           \---CO_INMS_REF.CAT
|
+-CALIB-----+---yyyyddd_CAL_vv.CSV
|           \---yyyyddd_CAL_vv.CSV
|
+-DATA------+----targ1--+---enc1----+---yyyyddd00_NEU_vv.CSV
            |           |           +---yyyyddd00_ION_vv.CSV
            |           |           +---yyyyddd00_NEU_vv.LBL
            |           |           +---yyyyddd00_ION_vv.LBL
            |           |           +---NEU_STRUCT_vv.FMT
            |           |           +---ION_STRUCT_vv.FMT
            |           +---enc2----+---yyyyddd00_ION_vv.CSV
            |           |           +---yyyyddd00_NEU_vv.LBL
            |           |           +---yyyyddd00_ION_vv.LBL
            |           |           +---yyyyddd03_L1A_vv.CSV
            |           |           +---NEU_STRUCT_vv.FMT
            |           |           +---ION_STRUCT_vv.FMT
            |           +---encN----
            |
            |----targ2--+---enc1----+---yyyyddd00_NEU_vv.CSV
|           |           |           +---yyyyddd00_ION_vv.CSV
|           |           |           +---yyyyddd00_NEU_vv.LBL
|           |           |           +---yyyyddd00_ION_vv.LBL
|           |           |           +---NEU_STRUCT_vv.FMT
|           |           |           +---ION_STRUCT_vv.FMT
|           |           +---encN----
|           |
            |----targN--+---encN
            +
```

APPENDIX B: DIRECTORY STRUCTURE FOR VOLUMES OF THE CO-S-INMS-2-PKT-U-V1.0 DATA SET

```
+-INDEX ----+---INDXINFO.TXT
|           +---INDEX.TAB
|           \---INDEX.LBL
|
+-DOCUMENT--+
|           +---DOCINFO.TXT
|           +---VOLSIS.DOC
|           +---VOLSIS.ASC
|           +---VOLSIS.LBL
|           \---additional documentation files and labels
|
+-CATALOG --+---CATINFO.TXT
|           +---CO_INMS_PKT_DS.CAT
|           +---CO_INSTHOST.CAT
|           +---CO_INMS_INST.CAT
|           +---CASSINI_MISSION.CAT
|           +---CO_INMS_PERSION.CAT
|           \---CO_INMS_REF.CAT
|
\-DATA------+----yyyy---+---ddd-----+---yyyyddd00_SCI_vv.CSV
            |           |           +---up to 23 additional SCI files
            |           |           +---yyyyddd00_SCI_vv.LBL
            |           |           +---up to 23 additional L1A Labels
            |           |           +---yyyyddd00_HKG_vv.CSV
            |           |           +---yyyyddd00_OTS_vv.CSV
            |           |           +---yyyyddd00_SMD_vv.CSV
            |           |           +---yyyyddd00_HMD_vv.CSV
            |           |           +---yyyyddd00_SCI_vv.LBL
            |           |           +---yyyyddd00_HKG_vv.LBL
            |           |           +---yyyyddd00_OTS_vv.LBL
            |           |           +---yyyyddd00_SMD_vv.LBL
            |           |           +---yyyyddd00_HMD_vv.LBL
            |           +---ddd-----+
            |           +---ddd-----+
            \----yyyy---+---ddd-----+
```

APPENDIX C: CALIBRATION REPORT DIRECTORY STRUCTURE

```
CALREPORT->
+---INMS_FU_Characterization
|   +---1-Directory
|   +---2-General
|   |   +---2.1-Document_status
|   |   +---2.2-Data_flow
|   |   +---2.3-Data_programs
|   |   +---2.4-Data_program_ouput
|   |   |   +---2.4.01-0130n2pri
|   |   |   +---2.4.02-0131n2sec
|   |   |   +---2.4.03-0131arsec
|   |   |   +---2.4.04-0201arpri
|   |   |   +---2.4.05-0201ch4sec
|   |   |   +---2.4.06-0202ch4pri
|   |   |   +---2.4.07-0202hepri
|   |   |   +---2.4.08-0202hesec
|   |   |   +---2.4.09-0204h2pri
|   |   |   +---2.4.10-0204h2sec
|   |   |   +---2.4.11-0205krpri
|   |   |   +---2.4.12-0205krsec
|   |   |   +---2.4.13-0208ar02.8ev
|   |   |   +---2.4.14-0209ar08.0ev
|   |   |   +---2.4.15-0209ar14.0ev
|   |   |   +---2.4.16-0210kr02.8ev
|   |   |   +---2.4.17-0210kr08.0ev
|   |   |   +---2.4.18-0210kr14.0ev
|   |   |   +---2.4.19-0211he02.8ev
|   |   |   +---2.4.20-0213c2h2sec
|   |   |   +---2.4.21-0213c2h2pri
|   |   |   +---2.4.22-0213c2h4pri
|   |   |   +---2.4.23-0213c2h4sec
|   |   |   \---2.4.24-0213noble
|   |   \---2.5-Miscellaneous_files
|   +---3-GSE_files
|   |   +---3.1-ATOL_sequences
|   |   +---3.2-ATOL_serial_numbers
|   |   +---3.3-SUN_files
|   |   |   +---3.3.4-GSE_data_therm_ion
|   |   |   \---3.3.5-GSE_phd_summary
|   |   +---3.4-Programs
|   |   |   +---3.4.1-avghk
|   |   |   \---3.4.2-avgscience_sp1
|   |   \---3.5-Misc_files
|   |       +---3.5.1-Commands
|   |       |   \---Commands
|   |       |       +---bak
|   |       |       \---tmp
|   |       \---3.5.2-Scripts
|   |           \---Scripts
v   v
```

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```
^   ^
|   |
|   +---4-Ions
|   |   +---4.1-Description
|   |   \---4.2-Data
|   |       +---4.2.1-Ion_energy
|   |       \---4.2.2-Other
|   |           +---4.2.2.1-INMS_quad_lens_setup
|   |           |   +---4.2.2.1.2.02-thermal_gas
|   |           |   +---4.2.2.1.2.03-2.8ev_ions
|   |           |   +---4.2.2.1.2.04-3.8ev_ions
|   |           |   +---4.2.2.1.2.05-6ev_ions
|   |           |   +---4.2.2.1.2.06-7.8ev_ions
|   |           |   +---4.2.2.1.2.07-10ev_ions
|   |           |   +---4.2.2.1.2.08-12ev_ions
|   |           |   +---4.2.2.1.2.09-14.3ev_ions
|   |           |   +---4.2.2.1.2.10-16.5ev_ions
|   |           |   +---4.2.2.1.2.11-20.15ev_ions
|   |           |   \---4.2.2.1.2.13-switch_lens_plots
|   |           +---4.2.2.2-Ion_ang_amp_plots
|   |           +---4.2.2.3-ion_sens
|   |           \---4.2.2.4-18_dalton_sweep
|   +---5-Thermal_gas
|   |   +---5.1-Description
|   |   \---5.2-Data
|   |       +---5.2.1-Gas_filament
|   |       |   +---5.2.1.1-Thermal_gas_plots
|   |       |   |   +---5.2.1.1.1-Therm_gas_18_swp
|   |       |   |   |   +---5.2.1.1.1-Therm_gas_18_swp.html
|   |       |   |   |   +---5.2.1.1.1-Therm_gas_18_swp.p65
|   |       |   |   |   \---5.2.1.1.1-Therm_gas_18_swp.pdf
|   |       |   |   \---5.2.1.1.2-Therm_gas_Hi_Lo
|   |       |   \---5.2.1.2-Thermal_gas_data
|   |       |       +---5.2.1.2.1-Initial_th_gas_data
|   |       |       \---5.2.1.2.1-Rev_th_gas_data
|   |       |           +---5.2.1.2.1_rev_1
|   |       |           +---5.2.1.2.1_rev_2
|   |       |           \---5.2.1.2.1_rev_3
|   |       |               +---0130n2pri_r3
|   |       |               +---0131arsec_r3
|   |       |               +---0131n2sec_r3
|   |       |               +---0201arpri_r3
|   |       |               +---0201ch4sec_r3
|   |       |               +---0202ch4pri_r3
|   |       |               +---0202hepri_r3
|   |       |               +---0202hesec_r3
|   |       |               +---0204h2pri_r3
|   |       |               +---0204h2sec_r3
|   |       |               +---0205krpri_r3
v   v       v               v
```

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```
^   ^       ^                ^
|   |       |                +---0205krsec_r3
|   |       |                +---0213c2h2pri_r3
|   |       |                +---0213c2h2sec_r3
|   |       |                +---0213c2h4pri_r3
|   |       |                +---0213c2h4sec_r3
|   |       |                \---FU_Thermal_Summary_r3
|   |       |                    +---FU_description_r3
|   |       |                    \---FU_files_r3
|   |       \---5.2.2-Other
|   |           +---5.2.2.1-N2_tracking
|   |           |   +---5.2.2.1.1-N2_tracking_descript
|   |           |   +---5.2.2.1.2-N2_tracking_data
|   |           |   +---5.2.2.1.3-N2_tracking_GSE_files
|   |           |   \---5.2.2.1.4-N2_tracking_plots
|   |           +---5.2.2.2-SRG_Baratron
|   |           +---5.2.2.3-Sensitivity_summary
|   |           \---5.2.2.4-Noble_gas_scan
|   |               \---5.2.2.4.2-noble_plots
|   \---6-Miscellaneous
|       +---6.1-Ion_defl_V
|       |   \---6.1.2-defl_dac_plots
|       +---6.2-INMS_volts
|       +---6.3-Chacterization_system
|       |   +---6.3.1-system_description
|       |   +---6.3.2-procedures
|       |   |   \---6.3.2.2-Therm_gas_inlet_dia
|       |   \---6.3.3-system_pictures
|       +---6.4-SEM_gain
|       |   +---6.4.2-SEM_gain_data
|       |   +---6.4.2.1_SEM_gain_descript
|       |   \---6.4.3-Sem_gain_plots
|       +---6.5-Open_source_quad_bias
|       +---6.6-INMS_trend_analysis
|       \---6.7-INMS_sensor
|           +---6.7.1-sensor_schematic
|           \---6.7.2-sensor_on_char_sys
v
```

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```
^
|
\---INMS_EU_Characterization
|   +---General
|   +---Ions
|   |   +---Argon_Ions
|   |   |   +---1998-0917-ArgonIons10V
|   |   |   +---1998-0917-ArgonIons13_5V
|   |   |   +---1998-0917-ArgonIons20V
|   |   |   \---1998-0917-ArgonIons6_5V
|   |   +---Helium_Ions
|   |   |   +---1998-0916-HeliumIons10V
|   |   |   +---1998-0916-HeliumIons13_5V
|   |   |   +---1998-0916-HeliumIons20V
|   |   |   \---1998-0916-HeliumIons6_5V
|   |   +---Hydrogen_Ions
|   |   |   +---1998-0917_HydrogenIons13_5V
|   |   |   +---1998-0917_HydrogenIons10V
|   |   |   +---1998-0917_HydrogenIons20V
|   |   |   \---1998-0917_HydrogenIons6_5V
|   |   +---KryptonIons
|   |   |   +---1998-0918-KryptonIons10V
|   |   |   +---1998-0918-KryptonIons13_5V
|   |   |   +---1998-0918-KryptonIons20V
|   |   |   \---1998-0918-KryptonIons6_5V
|   |   +---Neon_Ions
|   |   |   +---1998-0918-NeonIons10V
|   |   |   +---1998-0918-NeonIons13_5V
|   |   |   +---1998-0918-NeonIons20V
|   |   |   \---1998-0918-NeonIons6_5V
|   |   +---Nitrogen_Ions
|   |   |   +---1998-0910-NitrogenIons20V
|   |   |   +---1998-0911-NitrogenIons13_5V
|   |   |   +---1998-0914-NitrogenIons10V
|   |   |   +---1998-0915-NitrogenIons6_5V
|   |   |   \---1998-0928-NitrogenIons6_5V
|   |   +---Switching Lens
|   |   \---X_Ion_Summary
|   |       +---EU_FU_6_5ev_Compare
|   |       \---ion_fit
|   |           +---10ev_L1_30v
|   |           +---13_5ev_L1_30v
|   |           +---20ev_L1_30v
|   |           \---6.5ev_L1_30v
v   v
```

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```
^   ^
|   +---Neutral Beam
|   |   +---1998-0919_NeutralBeamTest
|   |   +---1998-0921-MoreBeaming
|   |   +---1998-0922-NeutralBeamArKrInH2
|   |   \---X_Neutral_Beam_Summary.xls
|   +---Nitrogen_Tracking
|   +---Thermal_Gas
|   |   +---Acetylene
|   |   |   \---1998-0720-AcetyleneCal
|   |   +---Argon
|   |   |   \---1998-0629-Argon
|   |   +---Argon in Helium
|   |   |   \---1998-0824-ArgonInHelium
|   |   +---Benzene
|   |   |   \---1998-1001-Benzene
|   |   +---Carbon Dioxide
|   |   |   \---1998-0729-CarbonDioxideCal
|   |   +---Carbon Monoxide in Helium
|   |   |   +---1998-0723-COinHelium
|   |   |   \---1998-0819-COinHelium
|   |   +---CarbonMonoxide
|   |   |   \---1998-0925-ThermalCO
|   |   +---Ethane
|   |   |   \---1998-0723-EthaneCal
|   |   +---Ethylene
|   |   |   \---1998-0722-EthyleneCal
|   |   +---Helium
|   |   |   \---1998-0715-Helium
|   |   +---Hydrogen
|   |   |   \---1998-0716-HydrogenCal
|   |   +---HydrogenCyanide in Helium
|   |   |   +---1998-0930-HCNinHelium_run_1
|   |   |   \---1998-0930-HCNinHelium_run_2
|   |   +---Krypton
|   |   |   \---1998-0716-KryptonCal
|   |   +---Methane
|   |   |   \---1998-0629_Methane
|   |   +---Methylacetylene (Propyne) in Helium
|   |   |   +---1998-0824-MethylacetyleneInHelium_run_1
|   |   |   \---1998-0824-MethylacetyleneInHelium_run_2
|   |   +---Neon
|   |   |   \---1998-0717-NeonCal
|   |   +---Nitrogen
|   |   |   \---1998-0629-Nitrogen
|   v
```

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```
/   ^
|   |   +---Oxygen
|   |   |   +---1998-0727-OxygenCal
|   |   |   \---1998-0728-OxygenCal
|   |   +---Propadiene (Allene) in Helium
|   |   |   +---1998-0820-PropadieneInHelium
|   |   |   \---1998-0821-PropadieneInHelium
|   |   +---Propane
|   |   |   \---1998-0717-Propane
|   |   \---X_Thermal_Summary
|   |       \---EU_FU_Thermal_Summary
|   |           +---EU_save
|   |           +---FU_description_r3
|   |           +---FU_save
|   |           \---V _Anicich_Communications
|   \---Miscellaneous
|
+---Other
```

APPENDIX D: L1A STRUCTURE FILE CONTENTS

```
/* 04-Mar-2005 DA Gell updates per J. Mafi                          */
/* 31-Mar-2005 DA Gell merged filament energy and status fields     */
/* 04-Apr-2005 DA Gell revised names of filament status             */
/* 08-Apr-2005 DA Gell replaced unit names with abbreviations       */
/* 07-Jun-2005 DA Gell corrected lengths and formats of some items  */
/* 16-Jun-2005 DA Gell Post-Peer Review                             */
/*                       changed ASCII_INT to ASCII_INTEGER         */
/*                               ASCII_FLOAT to ASCII_REAL          */
/*                       added column numbers                       */
/* 20-Jun-2005 DA Gell Post-Peer Review II                          */
/*                       Add note that target relative geometric    */
/*                       quantities are present within 1 hour of CA*/
/*                       Corrected Typos                            */
/*                       Added ion source mnemonics definition      */
/* 23-Jun-2005 DA Gell Added closing quotation marks where missing  */
/* 25-Jul-2008 DA Gell Corrected several field descriptions for     */
/*                     which the byte length (BYTES) or the range   */
/*                     (VALID_MINIMUM or VALID_MAXIMUM) are wrong   */
/* 30-Apr-2012 DA Gell Version 6,                                   */
/*                     Added fields MJDATE, C1RATE, C1ERROR,        */
/*                        C2RATE and C2ERROR.                       */
/*                     Corrected volts unit abbrievation            */
/*                        to V (ex v)                               */
/* 4-May-2012  DA Gell Added format keyword where missing:          */
/*                        SEQ_TABLE, SCAN_NUM                       */
/*                     Fixed formats for ION_DEF1, IONDEF2          */
/* 7-May-2012  DA Gell Moved C1COUNTS and C2COUNTS to the end of    */
/*                       the file for compatability with analysis   */
/*                       library.                                   */
/*******************************************************************/
```

```
   OBJECT        = FIELD
     FIELD_NUMBER  = 1
     BYTES         = 21
     DATA_TYPE     = TIME
     NAME          = "SCLK"
     FORMAT        = "A21"
     DESCRIPTION   = "Spacecraft
        event time in the UTC time
        scale expressed as a PDS
        compliant date-time
        string."
   END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 2
  BYTES         = 5
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "MJDAY"
  FORMAT        = "I5"
  DESCRIPTION   = "The date of
     the measurement expressed
     as the modified Julian day
     number at midnight UTC. The
     valid range corresponds to
     1987-205 through 2023-056"
  UNIT          = "days"
  VALID_MINIMUM = 47000
  VALID_MAXIMUM = 60000
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 3
  BYTES         = 8
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "UTTIME"
  FORMAT        = "I8"
  DESCRIPTION   = "Time of
     measurement expressed in
     msec since midnight UTC."
  UNIT          = "ms"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 86400001
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 4
  BYTES         = 26
  DATA_TYPE     = CHARACTER
  FORMAT        = "A26"
  NAME          = "TARGET"
  DESCRIPTION   = "Name of
     target body."
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 5
  BYTES         = 8
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "TIME_CA"
  FORMAT        = "I8"
  DESCRIPTION   = "Time since
     closest approach."
  UNIT          = "ms"
  VALID_MINIMUM = -86400000
  VALID_MAXIMUM = 86400000
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 6
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "TARG_POS_X"
  FORMAT        = "F9.0"
  DESCRIPTION   = "X component
     of the target body position
     in the IAU Saturn reference
     frame, included within 1
     hour of closest approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 7
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "TARG_POS_Y"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Y component
     of the target body position
     in the IAU Saturn reference
     frame, included within 1
     hour of closest approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 8
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "TARG_POS_Z"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Z component
     of the target body position
     in the IAU Saturn reference
     frame, included within 1
     hour of closest approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 9
  BYTES         = 4
  DATA_TYPE     = CHARACTER
  NAME          = "SOURCE"
  FORMAT        = "A4"
  DESCRIPTION   = "Ion source
     used for this measurement,
     Open Source Ion (osi)
     Closed Source Neutral(csn)
     Open Source Neutral Beam
     (osnb)
     Open Souce Neutral Thermal
     (osnt)"
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 10
  BYTES         = 4
  DATA_TYPE     = ASCII_INTEGER
  NAME          =
     "DATA_RELIABILITY"
  FORMAT        = "I4"
  DESCRIPTION   = "This value is
     set to a non-zero value
     during scans in which an
     instrument transition may
     cause data reliability
     concerns. (Not implemented
     in Version 06 data files)"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 11
  BYTES         = 8
  DATA_TYPE     = CHARACTER
  NAME          = "TABLE_SET_ID"
  FORMAT        = "A8"
  DESCRIPTION   = "Table set
     Identifier, consisting of
     an ID and revision number,
     TTTT-rrr."
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 12
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "COADD_CNT"
  FORMAT        = "I3"
  DESCRIPTION   = "Specifies the
     number of integration
     periods together. A value
     of 1 indicates no coadding,
     255 indicates maximum
     coadding - minimum data
     rate."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 13
  BYTES         = 7
  DATA_TYPE     = CHARACTER
  NAME          =
     "OSP_FIL_1_STATUS"
  FORMAT        = "A7"
  DESCRIPTION   = "Open source
     primary filament status
     (fil_1), OFF, LOW-EV (25eV)
     HIGH-EV (70eV)"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 14
  BYTES         = 7
  DATA_TYPE     = CHARACTER
  NAME          =
     "OSS_FIL_2_STATUS"
  FORMAT        = "A7"
  DESCRIPTION   = "Open source
     secondary filament status
     (fil_2), OFF, LOW-EV (25eV)
     HIGH-EV (70eV)"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 15
  BYTES         = 7
  DATA_TYPE     = CHARACTER
  NAME          =
     "CSP_FIL_3_STATUS"
  FORMAT        = "A7"
  DESCRIPTION   = "Closed source
     primary filament (fil_3)
     status, OFF, LOW-EV (27eV)
     HIGH-EV (71eV)"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 16
  BYTES         = 7
  DATA_TYPE     = CHARACTER
  NAME          =
     "CSS_FIL_4_STATUS"
  FORMAT        = "A7"
  DESCRIPTION   = "Closed source
     secondary filament (fil_4)
     status, OFF, LOW-EV (27eV)
     HIGH-EV(71eV)"
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 17
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "SEQ_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   = "Number of the
     sequence table controlling
     the instrument operation.
     This table lists a set of
     cycle tables, each one of
     which specifies one or more
     mass scans."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 64
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 18
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "CYC_NUM"
  FORMAT        = "I2"
  DESCRIPTION   = "The number of
     the cycle within the
     sequence, indexes in this
     sequence table."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 19
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "CYC_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the cycle table controlling
     the current mass scan. This
     table selects the mass,
     focus, trap, switching and
     D/A table used to operate
     the instrument for  mass
     scan."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 64
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 20
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "SCAN_NUM"
  FORMAT        = "I2"
  DESCRIPTION   = "The number of
     the scan within the cycle,
     indexes the cycle table."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 21
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "TRAP_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the trap table specifying
     collimator, deflector, top
     plate and OL4 voltages used
     in the mass scan."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 22
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "SW_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the Switching table
     specifying the quadrupole
     rod voltages."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 23
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "MASS_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the mass table specifying
     the 68 mass/charge values
     making up a mass scan."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 96
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 24
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "FOCUS_TABLE"
  FORMAT        = "I2"
  DESCRIPTION   =
     "Identification number of
     the focus table specifying
     OL1, OL2, OL3, endplate,
     ion lens, and quadrupole
     bias voltages."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 31
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 25
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  NAME          = "DA_TABLE"
  DESCRIPTION   =
     "Identification number of
     the D/A table specifying
     the electron multiplier and
     detector threshold
     settings."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 16
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 26
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          =
     "VELOCITY_COMP"
  FORMAT        = "F6.3"
  DESCRIPTION   = "Compensation
     velocity used in onboard
     computation of lens and
     deflector voltages"
  UNIT          = "km/s"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 50.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 27
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "IPNUM"
  FORMAT        = "I2"
  DESCRIPTION   = "Integration
     period number, indexes the
     mass, trap  switching and
     focus tables."
  VALID_MINIMUM = 1
  VALID_MAXIMUM = 68
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 28
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "MASS"
  FORMAT        = "F6.3"
  DESCRIPTION   = "Mass per unit
     charge detected during
     current integration period"
  UNIT          = "AMU/Z"
  VALID_MINIMUM = 0.125
  VALID_MAXIMUM = 100.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 29
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "OS_LENS2"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Open source
     lens 2 voltage."
  UNIT          = "V"
  VALID_MINIMUM = -10.00
  VALID_MAXIMUM =  10.00
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 30
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "OS_LENS1"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Open source
     lens 1 voltage."
  UNIT          = "V"
  VALID_MINIMUM = -10.00
  VALID_MAXIMUM =  10.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 31
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "OS_LENS4"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Open source
     lens 4 voltage."
  UNIT          = "V"
  VALID_MINIMUM = -62.00
  VALID_MAXIMUM =  62.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 32
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "OS_LENS3"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Open source
     lens 3 voltage."
  UNIT          = "V"
  VALID_MINIMUM = -62.00
  VALID_MAXIMUM =  62.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 33
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_LENS2"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Quadrapole 2
     lens voltages."
  UNIT          = "V"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 34
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_LENS1"
  FORMAT        = "F8.3"
  DESCRIPTION   = "Quadrupole 1
     lens voltages."
  UNIT          = "V"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 35
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_LENS4"
  FORMAT        = "F8.3"
  DESCRIPTION   = "Quadrupole 4
     lens voltages."
  UNIT          = "V"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 36
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_LENS3"
  FORMAT        = "F8.3"
  DESCRIPTION   = "Quadrupole 3
     lens voltages."
  UNIT          = "V"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 37
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  NAME          = "QP_BIAS"
  DESCRIPTION   = "Quadrupole
     bias voltage."
  FORMAT        = "F8.3"
  UNIT          = "V"
  VALID_MINIMUM = -200.0
  VALID_MAXIMUM = 200.0
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 38
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "ION_DEFL2"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Ion deflector
     2 voltage."
  UNIT          = "V"
  VALID_MINIMUM = -62.0
  VALID_MAXIMUM = 62.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 39
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "ION_DEFL1"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Ion deflector
     1 voltage."
  UNIT          = "V"
  VALID_MINIMUM = -62.0
  VALID_MAXIMUM = 62.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 40
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "ION_DEFL4"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Ion deflector
     4 voltage."
  UNIT          = "V"
  VALID_MINIMUM = -62.0
  VALID_MAXIMUM = 62.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 41
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "ION_DEFL3"
  DESCRIPTION   = "Ion deflector
     3 voltage."
  FORMAT        = "F6.2"
  UNIT          = "V"
  VALID_MINIMUM = -62.0
  VALID_MAXIMUM = 62.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 42
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "TOP_PLATE"
  FORMAT        = "F6.2"
  DESCRIPTION   = "Top plate
     lens voltage."
  UNIT          = "V"
  VALID_MINIMUM = -62.0
  VALID_MAXIMUM = 62.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 43
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "P_ENERGY"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Particle
     Energy."
  UNIT          = "eV"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 150.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 44
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "ALT_T"
  FORMAT        = "F9.2"
  DESCRIPTION   = "Altitude of
     the spacecraft above the
     surface of the named target
     body, included within 1
     hour of closest approach"
  UNIT          = "km"
  VALID_MINIMUM = -1.0E05
  VALID_MAXIMUM = 1.0E05
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 45
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_T_X"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the UNIT vector in the
     direction of the INMS
     aperture outward normal
     expressed in the target
     centered IAU coordinate
     frame, included within 1
     hour of closest approach."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 46
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_T_Y"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the UNIT vector in the
     direction of the INMS
     aperture outward normal
     expressed in the target
     centered IAU coordinate
     frame, included within 1
     hour of closest approach."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 47
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.6"
  NAME          = "VIEW_DIR_T_Z"
  DESCRIPTION   = "Components of
     the UNIT vector in the
     direction of the INMS
     aperture outward normal
     expressed in the target
     centered IAU coordinate
     frame, included within 1
     hour of closest approach."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 48
  BYTES         = 10
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_T_X"
  FORMAT        = "F10.2"
  DESCRIPTION   = "X-component
     of spacecraft position with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E05
  VALID_MAXIMUM = 1.0E05
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 49
  BYTES         = 10
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_T_Y"
  FORMAT        = "F10.2"
  DESCRIPTION   = "Y-component
     of spacecraft position with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km"
  VALID_MINIMUM = -2.0E05
  VALID_MAXIMUM = 2.0E05
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 50
  BYTES         = 10
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_T_Z"
  FORMAT        = "F10.2"
  DESCRIPTION   = "Z-component
     of spacecraft position with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km"
  VALID_MINIMUM = -2.0E05
  VALID_MAXIMUM = 2.0E05
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 51
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_X"
  FORMAT        = "F7.3"
  DESCRIPTION   = "X-component
     of spacecraft velocity with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 52
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_Y"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Y-component
     of spacecraft velocity with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 53
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_Z"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Z-component
     of spacecraft velocity with
     respect to the named target
     in the target centered IAU
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 54
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_SCX"
  FORMAT        = "F7.3"
  DESCRIPTION   = "X-component
     of spacecraft velocity with
     respect to the named target
     in the spacecraft centered
     coordinate frame, included
     within 1 hour of closest
     approach."
  UNIT          = "km/s"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 55
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_SCY"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Y-component
     of spacecraft velocity with
     respect to the named target
     in the spacecraft centered
     coordinate frame, included
     within 1 hour of closest
     approach"
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 56
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_T_SCZ"
  FORMAT        = "F7.3"
  DESCRIPTION   = "Z-component
     of spacecraft velocity with
     respect to the named target
     in the spacecraft centered
     coordinate frame, included
     within 1 hour of closest
     approach"
  UNIT          = "km/s"
  VALID_MINIMUM = -100.
  VALID_MAXIMUM = 100.
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 57
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "LST_T"
  FORMAT        = "F6.3"
  DESCRIPTION   = "The local
     solar time at the sub-
     spacecraft point on the
     target body, included
     within 1 hour of closest
     approach."
  UNIT          = "hr"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 24.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 58
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SZA_T"
  FORMAT        = "F7.3"
  DESCRIPTION   = "The solar
     zenith angle at the sub-
     satellite point on the
     target body, included
     within 1 hour of closest
     approach"
  UNIT          = "deg"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 180.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 59
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "SS_LONG_T"
  FORMAT        = "F6.2"
  DESCRIPTION   = "The west
     longitude of the sub-solar
     point on the target body,
     included within 1 hour of
     closest approach"
  UNIT          = "deg"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 360.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 60
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "DISTANCE_S"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Distance of
     the spacecraft from
     Saturn's center"
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 61
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_S_X"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the UNIT vector in the
     direction of the INMS
     aperture outward normal in
     the Saturn centered IAU
     coordinate frame."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 62
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_S_Y"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the UNIT vector in the
     direction of the INMS
     aperture outward normal in
     the Saturn centered IAU
     coordinate frame."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 63
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "VIEW_DIR_S_Z"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Components of
     the UNIT vector in the
     direction of the INMS
     aperture outward normal in
     the Saturn centered IAU
     coordinate frame."
  VALID_MINIMUM = -1.0
  VALID_MAXIMUM = 1.0
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 64
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_S_X"
  FORMAT        = "F9.0"
  DESCRIPTION   = "X-component
     of spacecraft position in
     the Saturn centered IAU
     coordinate frame."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 65
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_S_Y"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Y-component
     of spacecraft position in
     the Saturn centered IAU
     coordinate frame."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 66
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_POS_S_Z"
  FORMAT        = "F9.0"
  DESCRIPTION   = "Z-component
     of spacecraft position in
     the Saturn centered IAU
     coordinate frame."
  UNIT          = "km"
  VALID_MINIMUM = -1.0E07
  VALID_MAXIMUM = 1.0E07
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 67
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_S_X"
  FORMAT        = "F9.2"
  DESCRIPTION   = "X-component
     of spacecraft velocity in
     the Saturn centered IAU
     coordinate frame."
  UNIT          = "km/s"
  VALID_MINIMUM = -2000.
  VALID_MAXIMUM = 2000.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 68
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_S_Y"
  FORMAT        = "F9.2"
  DESCRIPTION   = "Y-component
     of spacecraft velocity in
     the Saturn centered IAU
     coordinate frame."
  UNIT          = "km/s"
  VALID_MINIMUM = -2000.
  VALID_MAXIMUM = 2000.
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 69
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "SC_VEL_S_Z"
  FORMAT        = "F9.2"
  DESCRIPTION   = "Z-component
     of spacecraft velocity in
     the Saturn centered IAU
     coordinate frame."
  UNIT          = "km/s"
  VALID_MINIMUM = -2000.
  VALID_MAXIMUM = 2000.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 70
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "LST_S"
  FORMAT        = "F6.3"
  DESCRIPTION   = "The local
     solar time at the
     subspacecraft point on
     Saturn"
  UNIT          = "hr"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 24.00
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 71
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  NAME          = "SZA_S"
  FORMAT        = "F7.3"
  DESCRIPTION   = "The solar
     zenith angle at the
     subsatellite point on
     Saturn"
  UNIT          = "deg"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 180.
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 72
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  NAME          = "SS_LONG_S"
  FORMAT        = "F6.2"
  DESCRIPTION   = "The west
     longitude of the sub-solar
     point on Saturn"
  UNIT          = "deg"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 360.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 73
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          =
     "SC_ATT_ANGLE_RA"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Right
     ascension of spacecraft z
     axis."
  UNIT          = "rad"
  VALID_MINIMUM = -3.14159
  VALID_MAXIMUM =  3.14159
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 74
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          =
     "SC_ATT_ANGLE_DEC"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Declination
     of spacecraft z axis."
  UNIT          = "rad"
  VALID_MINIMUM = -1.5707963
  VALID_MAXIMUM =  1.5707963
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 75
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          =
     "SC_ATT_ANGLE_TW"
  FORMAT        = "F9.6"
  DESCRIPTION   = "Rotation of
     spacecraft about z axis."
  UNIT          = "rad"
  VALID_MINIMUM = -3.1415926
  VALID_MAXIMUM = 3.1415926
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 76
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "C1RATE"
  FORMAT        = "F9.2"
  DESCRIPTION   = "High
     sentsitivity count rate,
     C2COUNTS/t, where t is the
     count accumulation period
     of 0.031104 s  times the
     co-add count, COADD_CNT"
  UNIT          = "1/s"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 1000000
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 77
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "C1ERROR"
  FORMAT        = "F9.2"
  DESCRIPTION   = "Statistical
     error in the high
     sensitivity count rate,
     (1/t)*sqrt(C1COUNTS) where
     where t is the count
     accumulation period of
     0.031104 s  times the co-
     add count, COADD_CNT"
  UNIT          = "1/s"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 1000000
END_OBJECT    = FIELD

OBJECT    = FIELD
  FIELD_NUMBER  = 78
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "C2RATE"
  FORMAT        = "F9.2"
  DESCRIPTION   = "Low
     sentsitivity count rate,
     C2COUNTS/t, where t is the
     count accumulation period
     of 0.031104 s  times the
     co-add count, COADD_CNT"
  UNIT          = "1/s"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 1000000
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 79
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  NAME          = "C2ERROR"
  FORMAT        = "F9.2"
  DESCRIPTION   = "Statistical
     error in the low
     sensitivity count rate,
     (1/t)*sqrt(C2COUNTS) where
     where t is the count
     accumulation period of
     0.031104 s  times the co-
     add count, COADD_CNT"
  UNIT          = "1/s"
  VALID_MINIMUM = 0.
  VALID_MAXIMUM = 1000000
END_OBJECT   = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 80
  BYTES         = 6
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "C1COUNTS"
  FORMAT        = "I6"
  DESCRIPTION   = "High
     sensitivity counts."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1000000
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 81
  BYTES         = 6
  DATA_TYPE     = ASCII_INTEGER
  NAME          = "C2COUNTS"
  FORMAT        = "I6"
  DESCRIPTION   = "Low
     sensitivity counts."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1000000
END_OBJECT    = FIELD
```

APPENDIX E: HKG STRUCTURE FILE CONTENTS

```
/*                                                                  */
/* 14-Sep-2004 D. Gell Updates Per J. Mafi                          */
/*                     Added FIELD_NUMBER keyword                   */
/*                                                                  */
/******************************************************************/

   OBJECT        = FIELD
     FIELD_NUMBER  = 1
     NAME      = "nOriginalPacketID"
     BYTES         = 10
     DATA_TYPE     = ASCII_INTEGER
     FORMAT        = "I10"
     DESCRIPTION   = "The unique
        database ID of the packet"
   END_OBJECT    = FIELD

   OBJECT        = FIELD
     FIELD_NUMBER  = 2
     NAME          = "nEventID"
     BYTES         = 10
     DATA_TYPE     = ASCII_INTEGER
     FORMAT        = "I10"
     DESCRIPTION   = "The ID that
        references the INMSDB data
        event the telemetry packet
        belongs to"
   END_OBJECT    = FIELD

   OBJECT        = FIELD
     FIELD_NUMBER  = 3
     NAME = "nAssocSciOrigpacketID"
     BYTES         = 10
     DATA_TYPE     = ASCII_INTEGER
     FORMAT        = "I10"
     DESCRIPTION   = "The
        associated science packet
        (the nearest  science
        packet chronologically) for
        this HK  packet. ** Not
        currently used."
   END_OBJECT    = FIELD

   OBJECT        = FIELD
     FIELD_NUMBER  = 4
     NAME          = "tSclkTime"
     BYTES         = 23
     DATA_TYPE     = CHARACTER
     FORMAT        = "A23"
     DESCRIPTION   = "The
        spacecraft clock time of
        the packet -  does not
        include milliseconds (see
        NSCLKMillis below for
        milliseconds)"
   END_OBJECT    = FIELD

   OBJECT        = FIELD
     FIELD_NUMBER  = 5
     NAME          = "dSclkRaw"
     BYTES         = 15
     DATA_TYPE     = ASCII_REAL
     FORMAT        = F15.1
     DESCRIPTION   = "The raw
        spacecraft clock time that
        TSCLKTIME and NSCLKMillis
        were generated  from"
   END_OBJECT    = FIELD

   OBJECT        = FIELD
     FIELD_NUMBER  = 6
     NAME          = "tErtTime"
     BYTES         = 23
     DATA_TYPE     = CHARACTER
     FORMAT        = "A23"
     DESCRIPTION   = "The Earth
        Receive Time - the time the
        packet was received from a
        NASA DSN  station"
   END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 7
  NAME        = "tProcessedTime"
  BYTES         = 23
  DATA_TYPE     = CHARACTER
  FORMAT        = "A23"
  DESCRIPTION   = "The UTC time
     the packet was processed by
     the INMS data system"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 8
  NAME          = "sMode"
  BYTES         = 10
  DATA_TYPE     = CHARACTER
  FORMAT        = "A10"
  DESCRIPTION   = "Packet mode,
     indicates if the packet is
     data or synthetic test
     data"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 9
  NAME          = "bValid"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Indicates
     that the packet is  a valid
     packet"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 10
  NAME          = "nInstMode"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Specifies the
     instrument operating mode"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 7
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 11
  NAME         =
     "nSequenceTable"
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "Sequence
     table number"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 31
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 12
  NAME          = "nCycleIndex"
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "Index of the
     cycle table entry"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 15
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 13
  NAME          = "nScanIndex"
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "The number of
     the scan within the cycle"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 15
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 14
  NAME          = "nElapsedTime"
  BYTES         = 5
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I5"
  DESCRIPTION   = "The time
     elapsed since the start of
     the  current sequence
     table"
  UNIT          = "s"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 65535
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 15
  NAME          = "nCycleTable"
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "Cycle table
     number"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 63
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 16
  NAME          = "nspare1"
  BYTES         = 17
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "2-bit field.
     LSB=ScanIndex MSB,
     MSB=CycleIndex MSB"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 17
  NAME          = "nDataSumN"
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "Number of
     mass scans being co-added
     to reduce  telemetry
     requirements"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 18
  NAME          = "nThermStatus"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Thermistor
     test status.  Performed
     before pressure BA test.
     Only valid prior to cover
     removal."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 3
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 19
  NAME          = "nThermDelta"
  BYTES         = 4
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I4"
  DESCRIPTION   = "Thermistor
     pressure AMUX value.  Amux
     ID=49.  Valid only prior to
     cover removal."
  VALID_MINIMUM = -512
  VALID_MAXIMUM = 512
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 20
  NAME          = "nFswVersion"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "Reports the
     flight software version"
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 21
  NAME          = "nBaStatus"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Pressure test
     status, valid only prior to
     cover removal"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 3
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 22
  NAME          = "nBaStep"
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "BA DAC
     emission value.  Valid only
     prior to cover removal."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 15
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 23
  NAME          = "nBaValue"
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "Pressure at
     end of test. Valid only
     prior to cover removal"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 15
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 24
  NAME          = "nTcReceived"
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "Number of
     telecommands received"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 25
  NAME          = "nAlfReceived"
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "Indicates a
     BIU bus error"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 26
  NAME          = "nAlfRejected"
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "Indicates a
     1750 machine error"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 15
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 27
  NAME          = "nTcRejected"
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "Number of
     telecommads rejected"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 15
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 28
  NAME          = "nInstTmMode"
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "Telmetry mode
     index"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 29
  NAME          = "nBiuSpare1"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Readback of
     BIU discretes 6 and 7"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 3
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 30
  NAME          = "bTgordt"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Readback of
     Flight computer boot mode
     descrete"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
```

```
  FIELD_NUMBER  = 31
  NAME        = "bAlfOverInhibit"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Readback of
     ALF override inhibit
     discrete"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 32
  NAME          =
     "bAlfBootEnable"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Readback of
     ALF boot enable discrete"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 33
  NAME          =
     "bDefSciEnable"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Readback of
     default science enable
     descrete"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 34
  NAME          = "bBiuSleep"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "readback of
     sleep discrete"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 35
  NAME          = "bBiuPord0"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "readback of
     BIU discrete 0"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 36
  NAME          = "bHkFull"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU error
     flag set when houskeeping
     tm buffer is full"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 37
  NAME          = "bHkSsysf"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU error
     flag set when subsystem
     fail bit is set  in 1553
     status word"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 38
  NAME          = "bHkMsgError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU error
     flag set when message error
     bit is set  in 1553 status
     word"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 39
  NAME          = "bTmScError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU error
     flag set when the number
     words expected  in 1553
     receive sub-address 29 is
     incorrect"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 40
  NAME          = "bStTblError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU error
     flag set when the number
     words expected in  1553
     receive sub-address 19 is
     incorrect"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 41
  NAME          = "bAncbcError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU error
     flag set when the number
     words expected in 1553
     receive sub-address 10 is
     incorrect"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 42
  NAME          = "bbiuspare2"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "spare, always
     0"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 43
  NAME          = "bRtiSfail"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when no
     RTIs have been received for
     2 seconds"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 44
  NAME          = "bFil1On"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "State of
     primary open source
     filament"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 45
  NAME          = "bFil2On"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "State of
     secondary open source
     filament"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 46
  NAME          = "bFil3On"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "State of
     primary closed source
     filament"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 47
  NAME          = "bFil4On"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "State of
     secondary closed source
     filament"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 48
  NAME          = "bDconSpare1"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "spare"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 49
  NAME          = "bFil6On"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "State of  BA
     pressure  gauge filament"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 50
  NAME          = "nDconSpare2"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "spare"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 3
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 51
  NAME          = "bBiuWdx"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU watchdog
     timer status, 1(ok)
     0(expired)"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 52
  NAME          = "bBiuFt"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU write
     status, set to 0 when a BIU
     bus timeout  is detected in
     boot code"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 53
  NAME          = "bFcft"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU write
     status, set to 0 when a CPU
     Machine Error  is detected
     in boot code"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 54
  NAME          = "bFctGo"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU write
     status, set when TGO reset
     indicator latch is set on
     bootup.  Always set to 0 in
     TM."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 55
  NAME          = "bFcillad"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU write
     status, set to 0 when CPU
     accesses an  illegal
     address.  Always set to 0
     in TM."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 56
  NAME          = "bFcnpu"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU write
     status, set to 1 when CPU
     completes a  normal power
     up.  Always set to 0 in
     TM."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 57
  NAME          = "bFcsuren"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU write
     status, set to 0 when CPU
     start-up RAM is enabled.
     Always set to 0 in TM."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 58
  NAME          =
     "bBiuDtsLoaded"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "BIU write
     status, set to 1 when BIU
     descriptor table is loaded
     on bootup."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 59
  NAME          = "d1emission"
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F7.4"
  DESCRIPTION   = "Emission
     Current of primary open
     source filament"
  UNIT          = "uA"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 25.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 60
  NAME          = "d2emission"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Emission
     Current of secondary open
     source filament"
  UNIT          = "uA"
  VALID_MINIMUM = 0.05
  VALID_MAXIMUM = 25.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 61
  NAME          = "dImon1"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.6"
  DESCRIPTION   = "Input
     current"
  UNIT          = "A"
  VALID_MINIMUM = 0.0
  VALID_MAXIMUM = 1.75
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 62
  NAME          = "dGround1"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Ground
     reference voltage"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 63
  NAME          = "d1Current"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Primary open
     source filament current"
  UNIT          = "A"
  VALID_MINIMUM = -0.1
  VALID_MAXIMUM = 1.5
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 64
  NAME          = "d2Current"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Secondary
     open source filament
     current"
  UNIT          = "A"
  VALID_MINIMUM = -0.1
  VALID_MAXIMUM = 1.5
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 65
  NAME          = "d1Target"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Primary open
     source anode current"
  UNIT          = "uA"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 27.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 66
  NAME          = "d2Target"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Secondary
     open source anode current"
  UNIT          = "uA"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 27.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 67
  NAME          = "d1Bias50"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Open Source
     +40V Bias Oscillator Drive
Current "
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 68
  NAME          = "d1Bias70"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Open Source
     primary Filament Bias
     Oscillator Drive Current"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 69
  NAME          = "d2Bias70"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Open Source
     secondary Filament Bias
Oscillator Drive Current"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 70
  NAME          = "dGround2"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Ground
     reference voltage"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 71
  NAME          = "dAmString"
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.4"
  DESCRIPTION   = "AM Board
     Resistor Divider String
     Current"
  UNIT          = "V"
  VALID_MINIMUM = -645.
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 72
  NAME          = "dFbString"
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.4"
  DESCRIPTION   = "FB Board
     Resistor Divider String
     Current"
  UNIT          = "V"
  VALID_MINIMUM = -513.
  VALID_MAXIMUM = 4.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 73
  NAME          = "dBaCollector"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "BA  pressure
     gage collector current"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 74
  NAME          = "dFbControl"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "-390V
     Regulator Control Voltage "
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 75
  NAME          = "d3Emission"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Emission
     Current of primary closed
     source filament"
  UNIT          = "uA"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 25.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 76
  NAME          = "d4Emission"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Emission
     Current of secondary closed
     source filament"
  UNIT          = "uA"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 25.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 77
  NAME          = "dImon2"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.6"
  DESCRIPTION   = "Input
     current"
  UNIT          = "A"
  VALID_MINIMUM = 0.0
  VALID_MAXIMUM = 1.75
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 78
  NAME          = "dEb4_4"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "anode 3
     current monitor in volts"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 79
  NAME          = "d3Current"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Primary
     closed source filament
     current"
  UNIT          = "A"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 1.5
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 80
  NAME          = "d4Current"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Secondary
     closed source filament
     current"
  UNIT          = "A"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 1.5
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 81
  NAME          = "d4Anode"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Primary
     closed source anode
     current"
  UNIT          = "uA"
  VALID_MINIMUM = -0.1
  VALID_MAXIMUM = 10.2
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 82
  NAME          = "d3Anode"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Secondary
     closed source anode
     current"
  UNIT          = "uA"
  VALID_MINIMUM = -0.1
  VALID_MAXIMUM = 10.2
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 83
  NAME          = "d3Bias50"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Closed Source
     +40V Bias Oscillator Drive
     Current"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 84
  NAME          = "d3Bias70"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Closed
     Source primary Filament
     Bias Oscillator Drive
     Current"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 85
  NAME          = "d4Bias70"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Closed
     Source secondary Filament
     Bias Oscillator Drive
     Current"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 86
  NAME          =
     "dRfSupplyTemp"
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.6"
  DESCRIPTION   = "RF power
     supply temperature"
  UNIT          = "C"
  VALID_MINIMUM = 13.
  VALID_MAXIMUM = 32.5
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 87
  NAME          =
     "dFbSupplyTemp"
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.6"
  DESCRIPTION   = "FB Board
     temperature"
  UNIT          = "C"
  VALID_MINIMUM = 13.
  VALID_MAXIMUM = 32.5
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 88
  NAME          =
     "dEmSupplyTemp"
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.6"
  DESCRIPTION   = "EM Board
     temperature"
  UNIT          = "C"
  VALID_MINIMUM = 13.
  VALID_MAXIMUM = 32.5
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 89
  NAME          = "dPlus5Fb"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Thermister +5
     reference voltage"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 90
  NAME          = "dBaGrid"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.4"
  DESCRIPTION   = "BA pressure
     gage grid current"
  UNIT          = "uA"
  VALID_MINIMUM = -2.
  VALID_MAXIMUM = 152.
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 91
  NAME          = "dOl1"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Open Lens 1
     (CEU) Current"
  UNIT          = "uA"
  VALID_MINIMUM = -0.1
  VALID_MAXIMUM = 6.8
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 92
  NAME          = "dOl2"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.5"
  DESCRIPTION   = "Open Lens 2
     (CEU) Current "
  UNIT          = "uA"
  VALID_MINIMUM = -0.1
  VALID_MAXIMUM = 6.8
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 93
  NAME          = "dBaCurrent"
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.6"
  DESCRIPTION   = "BA pressure
     gage filament current"
  UNIT          = "A RMS"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 1.4
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 94
  NAME          = "dBaEmission"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.4"
  DESCRIPTION   = "BA pressure
     gage emission current"
  UNIT          = "uA"
  VALID_MINIMUM = -1.6
  VALID_MAXIMUM = 193.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 95
  NAME          = "dGround3"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Ground
     reference voltage"
  UNIT          = "V"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 96
  NAME          = "dBaBias"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "BA pressure
     gage bias oscillator drive
     current"
  UNIT          = "V"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 97
  NAME          = "dRfAgc"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "RF automatic
     gain control monitor
     voltage"
  UNIT          = "V"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 98
  NAME          = "dMinus5_7"
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F7.4"
  DESCRIPTION   = "Monitor -5.7
     Volt supply"
  UNIT          = "V"
  VALID_MINIMUM = -7.
  VALID_MAXIMUM = 5.2
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 99
  NAME          = "dFcTemp"
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.6"
  DESCRIPTION   = "Flight
     computer board temperature"
  UNIT          = "C"
  VALID_MINIMUM = 18.5
  VALID_MAXIMUM = 36.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 100
  NAME          = "dLvpStemp"
  BYTES         = 9
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F9.6"
  DESCRIPTION   = "Low voltage
     power supply frame
     temperature"
  UNIT          = "C"
  VALID_MINIMUM = 23.25
  VALID_MAXIMUM = 31.25
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 101
  NAME          = "dEm1Current"
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F7.4"
  DESCRIPTION   = "Electron
     multiplier 1 current
     monitor"
  UNIT          = "KV"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 38.1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 102
  NAME          = "dEm2Current"
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F7.4"
  DESCRIPTION   = "Electron
     multiplier 2 current
     monitor"
  UNIT          = "KV"
  VALID_MINIMUM = -0.5
  VALID_MAXIMUM = 38.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 103
  NAME          = "dImon3"
  BYTES         = 8
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F8.6"
  DESCRIPTION   = "Input
     current"
  UNIT          = "A"
  VALID_MINIMUM = 0.0
  VALID_MAXIMUM = 1.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 104
  NAME          = "dMultAna1"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Pulse Amp 1
     Analog Voltage Proportional
     to Input Frequency "
  UNIT          = "uA"
  VALID_MINIMUM = -0.1
  VALID_MAXIMUM = 10.2
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 105
  NAME          = "dMultAna2"
  BYTES         = 6
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F6.3"
  DESCRIPTION   = "Pulse Amp 2
     Analog Voltage Proportional
     to  Input Frequency "
  UNIT          = "uA"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 1.75
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 106
  NAME          = "dPlus5r"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Monitor 5R
     voltage"
  UNIT          = "V"
  VALID_MINIMUM = -0.1
  VALID_MAXIMUM = 10.2
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 107
  NAME         =
     "dThermPressInt"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "Internal BA
     pressure gage temperature"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 108
  NAME         =
     "dThermPressExt"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.2"
  DESCRIPTION   = "External BA
     pressure gage temperature"
  UNIT          = "V"
  VALID_MINIMUM = -0.05
  VALID_MAXIMUM = 5.1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 109
  NAME          = "dPlus13"
  BYTES         = 7
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F7.4"
  DESCRIPTION   = "Monitor +13
     voltage"
  UNIT          = "V"
  VALID_MINIMUM = -0.2
  VALID_MAXIMUM = 14.75
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 110
  NAME          = "nIndex"
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "AMUX index of
     first channel sampled for
     latest scan."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 111
  NAME          = "dRfFreq"
  BYTES         = 5
  DATA_TYPE     = ASCII_REAL
  FORMAT        = "F5.3"
  DESCRIPTION   = "Frequency
     monitor"
  VALID_MINIMUM = 0.0
  VALID_MAXIMUM = 0.22
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 112
  NAME          =
     "nCpuIdleCounter"
  BYTES         = 2
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "Flight
     computer heartbeat counter"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 15
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 113
  NAME          = "bDisc0Reset"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set to 1 on
     bootup to indicate last CPU
     reset was  due to BIU
     discrete 0."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 114
  NAME          = "bAllSysGo"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Master INMS
     error flag"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 115
  NAME       =
     "bAllSysGoLatched"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Latched
     version of master INMS
     error flag"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 116
  NAME          =
     "bExcNoHandler"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "unhandled
     exception occured "
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 117
  NAME          = "bSafeMode"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "not used"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 118
  NAME          = "bForcedSleep"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Indicates the
     instrument entered Sleep
     state due to  detected high
     value on IMONs"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 119
  NAME          = "bBiuAutoInit"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "3-bit field
     that counts BIU auto-
     initializations."
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 120
  NAME          = "bGseTest"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "not used"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 121
  NAME    = "bSystemInitialized"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Indicates
     system initialization
     complete"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 122
  NAME     = "bSystemConfigured"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Indicates
     system configuration is
     complete"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 123
  NAME          = "bTgoDetect"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Readout of
     watchdog reset latch on FC
     board during bootup.
     Usually set to 1 -
     unreliable indicator."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 124
  NAME          = "bBiuReseToCc"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Indicates
     that a BIU reset has
     occured"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 125
  NAME          = "bIcError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set to 1 on
     bootup if reset is due to
     wayward  instruction
     counter (jump to location
     0)."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 126
  NAME          = "bTgoToggle"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Toggled
     between 1 and 0 each time
     the Watchdog Reset Task
     executes"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 127
  NAME          = "nSubModuleID"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "Ada exception
     sub-module ID (CSU)
     0=SciPkt, 1= Usid,
     4=UseqISR, 8=USIDLostSync"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 128
  NAME          = "nTrapFlag"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Ada
     exception/error type:
     0=Trace_Trap, 1=Error_Trap,
     2=Exception_Trap"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 3
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 129
  NAME          = "nModuleId"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I2"
  DESCRIPTION   = "Ada exception
     module ID (CSC)
     1=INMS_Exec, 2=INMS_Init,
     3=AMux_IO, 4=DMux_IO,
     5=DCon_IO, 6=CDS_IO,
     7=Useq_IO, 8-10=spare,
     11=Filament Control, 12=Ion
     Source Select Control,
     13=Ion Focus Control, 14=HV
     Focus Control, 15=Quad Rod
     Control, 16=Ion Det.
     Control, 17=Ion Pump
     Control, 18=Pressure Sensor
     Monitor, 19=Power Supply
     Monitor, 20=Micro-Sequencer
     Control"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 63
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 130
  NAME          = "bInmsBitFail"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Bootstrap
     Built-in-Test results"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 131
  NAME          =
     "bTmBuffOvrflw"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when the
     allotted memory buffer area
     for  TM packets would have
     overflowed"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 132
  NAME          = "bAlfBoot"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when an
     ALF Boot is performed"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 133
  NAME          = "bAlfError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when any
     BIU or ALF error is
     detected  during an ALF
     Boot"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 134
  NAME          = "bBiuMemerror"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when
     background BIU verification
     processing  detects a bad
     BIU memory location. No
     longer used."
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 135
  NAME          =
     "bOdbfrOverflow"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Output data
     buffer overflow. Not used"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 136
  NAME          =
     "bUseqOOffline"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when
     micro-sequencer output
     communication  goes
     offline"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 137
  NAME          =
     "bUseqIOffline"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when
     micro-sequencer input
     communication  goes
     offline"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 138
  NAME          = "bUseqError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when any
     micro-sequencer error is
     detected"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 139
  NAME          = "b1750me"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when the
     1750 Machine Error
     interrupt occurs  and FT
     register <> 0400h"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 140
  NAME          = "bAmuxError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "not used"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 141
  NAME          = "bCdsOOffline"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when
     BIU/CDS output
     communication goes offline"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 142
  NAME          = "bCdsIOffline"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set when
     BIU/CDS input communication
     goes offline"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 143
  NAME          = "bCdsError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "set if one or
     more of 1750ME, CDSoOffline
     or CDSiOffline are set"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 144
  NAME          = "bRteError"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = "Set any time
     bootstrap or RTE processing
     detects any of the
     following errors: 1750 BIT
     Fail;  Any Memory Test
     fails; Unhandled
     Exceptions;  Machine Error;
     TGO Reset or Wayward IC
     Reboot"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 145
  NAME          = "nMemChecksum"
  BYTES         = 1
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I1"
  DESCRIPTION   = " memory
     checksum error flag in FSW
     Version 8 or later 0(ok)
     1(bad checksum)"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 1
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 146
  NAME          = "nStmCounter"
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "Count of
     spacecraft tm mode message
     received  (1 per second)"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 147
  NAME          = "nRtiCounter"
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "Count of RTIs
     processed"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD
```

```
OBJECT        = FIELD
  FIELD_NUMBER  = 148
  NAME          = "nMassTable"
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "value of
     initial mass in current
     mass table"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 149
  NAME          = "nCmdSerno1"
  BYTES         = 3
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I3"
  DESCRIPTION   = "Serial Number
     and Time of the telecommand
     that is  being
     acknowledged. Only two are
     maintained for  each
     Packet"
  VALID_MINIMUM = 0
  VALID_MAXIMUM = 255
END_OBJECT    = FIELD

OBJECT        = FIELD
  FIELD_NUMBER  = 150
  NAME          =
     "nSclkMilliSec"
  BYTES         = 9
  DATA_TYPE     = ASCII_INTEGER
  FORMAT        = "I9"
  DESCRIPTION   = "The
     milliseconds of the time of
     the  packet. When used in
     combination with TSCLKTIME
     produces the exact
     spacecraft clock time the
     packet was generated"
END_OBJECT    = FIELD
```