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DATA FORMAT CONTROL DOCUMENT (DFCD) BETWEEN THE INTERNATIONAL SOLAR-TERRESTRIAL PHYSICS (ISTP) PROGRAM MISSION OPERATIONS AND SYSTEMS DEVELOPMENT DIVISION (MOSDD) GROUND DATA PROCESSING SYSTEM AND THE ISTP MISSION INVESTIGATORS

REVISION 2

MAY 1996

National Aeronautics and
Space Administration

Goddard Space Flight Center
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Revision 2

Prepared for

MISSION OPERATIONS AND SYSTEMS DEVELOPMENT DIVISION
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Revision 2

Prepared by: Computer Sciences Corporation
SEAS Contract NAS5–31000
Subcontract HQ-001057

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LIST OF EFFECTIVE PAGES

All

DCN CONTROL SHEET

Use this control sheet to record the DCN changes to this document.

DCN No.	DTG	Mon/Yr	Sect.	Initials

ABSTRACT

This data format control document (DFCD) defines the formats of the data provided to the International Solar-Terrestrial Physics (ISTP) program mission investigators by the ISTP Central Data Handling Facility (CDHF) and the Mission Operations and Systems Development Division (MOSDD) Data Distribution Facility (DDF). The ISTP mission investigators are those investigators responsible for an experiment onboard the ISTP spacecraft, as well as ground-based and theory investigators. The ISTP CDHF and the MOSDD DDF are elements of the ISTP Ground Data Processing System (GDPS) at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC). The ISTP CDHF is an ISTP project-funded facility that provides instrument data processing and data access support for ISTP missions. The DDF is an MOSDD institutional facility that sends the data on physical media to the scientific investigators.

A detached ISTP standard formatted data unit (SFDU) header is associated with ISTP CDHF managed data files. The National Space Science Data Center's (NSSDC's) common data format (CDF) is used for key parameter, orbit, and attitude data.

To date, key parameter formats have been very dynamic. As a result, they have been removed temporarily from this document.

The WIND level-zero, housekeeping, and quality and accounting tables in this document reflect the *Command and Telemetry Handbook, WIND, Revision 3.2*, September 1, 1993 (Reference 8). The POLAR level-zero, housekeeping, and quality and accounting tables in this document reflect the *POLAR Command and Telemetry Handbook*, *Revision 3.1*, January 15, 1995 (Reference 9).

The formats of SOHO orbit and attitude, including the full-time resolution attitude, data files are documented in Sections 3.6 and 3.7 of this DFCD. No other SOHO data formats are documented here. The formats of the SOHO telemetry packets, including level-zero and housekeeping data are defined in Section 10 of the *Interface Control Document Between the Sensor Data Processing Facility (SDPF) and the Solar and Heliospheric Observatory (SOHO) Consumers* (Reference 12).

SOHO data filenames conform to either the ISTP CDHF or the MOSDD Packet Processor Data Capture Facility II (Pacor II) file-naming conventions, as applicable. The two conventions, and information on which SOHO files conform to which convention, are described in Appendix D, Section D.1. In addition, the ISTP CDHF SFDU header and the Pacor II SFDU are described there.

This revision provides updated orbit and attitude formats and updated ISTP compact disc–read-only memory (CD-ROM) directory structure.

The POLAR wideband data formats have been added as Appendix E. The data formats from the CDHF Near Real Time (NRT) Server are described in Appendix F.

In Section 3.3.3.3 (POLAR Spacecraft Housekeeping Data Record and Subrecord Formats), the number of the byte containing the POLAR Magnetic Field Investigation (MFE) magnetometer MNTSCALE value has been corrected.

The information in this document reflects Release 6.2 of the ISTP CDHF software and Release 3.2.1 of the MOSDD DDF software.

Computer Sciences Corporation (CSC) is responsible for maintaining this document. Please send all additions, corrections, or questions to ISTP::USER_DOC.

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SECTION 1—INTRODUCTION

1.1 Purpose

This data format control document (DFCD) defines and describes the formats of the mission data items made available or transferred from the International Solar-Terrestrial Physics (ISTP) program Central Data Handling Facility (CDHF) and the Mission Operations and Systems Development Division (MOSDD) Data Distribution Facility (DDF) to the individual ISTP investigators, either electronically or on physical media.

Throughout the remainder of this DFCD, the ISTP CDHF is abbreviated to the CDHF and the MOSDD DDF is abbreviated to the DDF.

The source requirements for this interface are derived from the ISTP Data Processing Segment (DPS) System Requirements Specification (Reference 1).

1.2 Scope

This DFCD contains detailed descriptions of the data formats applicable to the Geomagnetic Tail Laboratory (GEOTAIL), Interplanetary Physics Laboratory (WIND), and Polar Plasma Laboratory (POLAR) missions of the ISTP program. The scope of this DFCD includes the detailed specification of the data formats used in support of the interface provided by all parties. This document does not include the description of the SOHO level-zero (LZ) data, which are described in the Interface Control Document between the Sensor Data Processing Facility (SDPF) and the Solar and Heliospheric Observatory (SOHO) Consumers (Reference 12). The formats of the SOHO summary, command history, time correlation file (TCF) and SOHO daily report (SDR) data also are not provided in this document. They can be obtained from the SOHO Experimenters' Operations Facility (EOF).

This DFCD is a configuration-controlled document and, with several other documents, forms the ISTP project baseline. This DFCD takes effect upon approval by the ISTP Deputy Project Scientist for Data Systems, Code 694, the ISTP CDHF Project Manager, Code 514.1, and the MOSDD DDF Project Manager, Code 514.1. Proposed changes to this DFCD require the same level of approval.

The format and content of this DFCD comply with the ISTP project-approved guidelines for interface control documents (ICDs). The ICD guidelines recommend documenting the format information usually found in separate ICDs in one composite document (this DFCD) to reduce redundancy and ease maintainability, thus reducing costs and facilitating the assurance of accuracy. Therefore, the detailed information describing the formats of the ISTP data items provided to the individual investigations by the CDHF and the DDF has been moved from the individual ICDs to this document.

This DFCD also defines and describes the formats of the files transferred from the MOSDD Generic Time-Division Multiplexed (GTDM) Data Capture Facility (DCF) to the ISTP CDHF, from the ISTP CDHF to the MOSDD DDF, and from the MOSDD GTDM DCF to the MOSDD DDF because the formats of these files are essentially the same as those provided to the ISTP mission investigators by the ISTP CDHF and the MOSDD DDF. Documenting the file formats in just one document (i.e., this DFCD) further reduces document redundancy and facilitates document maintainability. Formats of files not transferred to investigators are not documented in this document.

1.3 Intended Users

This document specifies the interface data formats at the level of detail needed by users on either side of the interface to proceed with independent system development. This document contains the layouts and contents of the data files (level-zero, orbit, and attitude) used by the key parameter generation software (KPGS) of the mission investigators, as well as the key parameters.

1.4 Documentation Precedence

This document supplements the ISTP project ICDs. These ICDs contain details of the interface needed by the implementers. Where any conflict exists between this document and an ICD, the ICD takes precedence over the generalized DFCD. The ICDs listed in Table 1–1 are supplemented by this document. The ICDs listed below contain details of the interface between the CDHF, the DDF, and the ISTP principal investigators (PIs), co-investigators (Co-Is), ground-based investigators (GBIs), and theory investigators (TIs).

Table 1–1. Supplemental ICDs (1 of 2)

ICD Number	ICD Name (Note 1)	Draft	Status
560-1ICD/0489	CDHF/DDF-NSSDC	August 94	Final
560-1ICD/0589	CDHF-SPOF	April 93	Final
560-1ICD/0190	CDHF/DDF-DARN GBI	May 96	Final
560-1ICD/0290	CDHF/DDF-SESAME GBI	December 94	Final
560-1ICD/0390	CDHF/DDF-CANOPUS GBI	February 95	Final
560-1ICD/0490	CDHF/DDF-SONDRESTROM GBI	December 92	Final
560-1ICD/0590	CDHF/DDF-TI IMC	April 90	Review Draft
560-1ICD/0690	CDHF/DDF-TI SWMC	April 90	Review Draft
560-1ICD/0790	CDHF/DDF-TI TED	April 90	Review Draft
560-1ICD/0890	CDHF/DDF-TI SS	April 90	Review Draft
560-1ICD/0990	CDHF/DDF-EPACT PI (W)	December 94	Final
560-1ICD/1090	CDHF/DDF-KONUS PI (W)	December 94	Final
560-1ICD/1190	CDHF/DDF-3DPA PI (W)	December 94	Final
560-1ICD/1290	CDHF/DDF-MFI PI (W)	April 95	Final
560-1ICD/1390	CDHF/DDF-FDF, Revision 1	April 95	Final
560-1ICD/1490	CDHF/DDF-CAMMICE PI (P)	July 95	Sign Off
560-1ICD/1590	CDHF/DDF-CEPPAD PI (P)	July 95	Sign Off

Table 1–1. Supplemental ICDs (2 of 2)

ICD Number	ICD Name (Note 1)	Draft	Status
560-1ICD/1690	CDHF/DDF-EFI PI (P)	May 96	Final
560-1ICD/1790	CDHF/DDF-HYDRA PI (P)	July 95	Sign Off
560-1ICD/1890	CDHF/DDF-WAVES PI (W)	February 95	Final
560-1ICD/1990	CDHF/DDF-TGRS PI (W)	March 94	Final
560-1ICD/2090	CDHF/DDF-SWE PI (W)	January 95	Final
560-1ICD/2190	CDHF/DDF-SMS PI (W)	December 94	Final
560-1ICD/2290	CDHF/DDF-MGF Co-I (G)	August 92	Final
560-1ICD/2390	CDHF/DDF-EFD Co-I (G)	August 92	Final
560-1ICD/2490	CDHF/DDF-PWI Co-I (G)	August 92	Final
560-1ICD/2590	CDHF/DDF-MFE PI (P)	May 96	Final
560-1ICD/2690	CDHF/DDF-PIXIE PI (P)	April 96	Final
560-1ICD/2790	CDHF/DDF-PWI PI (P)	March 96	Final
560-1ICD/2890	CDHF/DDF-TIDE PI (P)	May 96	Sign Off
560-1ICD/2990	CDHF/DDF-TIMAS PI (P)	March 96	Final
560-1ICD/3090	CDHF/DDF-UVI PI (P)	October 95	Final
560-1ICD/3190	CDHF/DDF-VIS PI (P)	April 96	Final
560-1ICD/3290	CDHF/DDF-CPI PI (G)	August 92	Final
560-1ICD/3390	CDHF/DDF-EPIC PI (G)	August 92	Final
560-1ICD/3490	CDHF-GDCF-DDF	June 93	Final
560-1ICD/0191	ISAS GSFC IPD (G)	September 92	Final
560-1ICD/0441	CDHF-CMS	May 93	Final
560-1ICD/0193	CDHF/DDF-WIND Investigators	January 96	Final
560-1ICD/0293	CDHF/DDF-POLAR Investigators	April 93	Review
560-1ICD/1093	CDHF-SOHO EOF	August 94	Final
560-1ICD/0194	CDHF-ERNE PI (S)	May 96	Sign Off
560-1ICD/0294	CDHF/DDF-CELIAS PI (S)	May 96	Sign Off
560-1ICD/0394	CDHF-COSTEP PI (S)	July 94	Sign Off
560-1ICD/0494	CDHF/DDF-CELIAS/CEPAC PI (S)	May 96	Sign Off
514-1ICD/0195	CDHF/DDF-SEPS (P)	May 96	Sign Off
514-1ICD/0295	CDHF/DDF-GOLF, VIRGO, MDI, SUMER, CDS, LASCO, EIT, UVCS, SWAN PIs (S)	January 96	Sign Off

Notes: 1. Interface names are shown on either side of the hyphen (-). Systems composing one side of an interface are separated by a slash(/).
2. Spacecraft indicator: (G) = GEOTAIL, (W) = WIND, (P) = POLAR, (S) = SOHO.

1.5 ISTP Scientific Investigator Community

Table 1–2 lists the ISTP spacecraft mission experiments and their PIs.

1.6 Document Organization

Section 1 specifies the purpose, scope, and intended usage of this DFCD and lists the ISTP Scientific Investigator Community. Section 2 provides an overview of the ISTP data formats. Section 3 documents the formats of all the data files provided from the CDHF and the DDF to an investigator's remote data analysis facility (RDAF).

Appendix A provides the level-zero data volume for each of the GEOTAIL, WIND, and POLAR instruments. Appendix B provides the key parameter volume estimate for each of the GEOTAIL, WIND, POLAR, and ground-based investigations. Appendix C provides the extended minor frames for the GEOTAIL, WIND, and POLAR missions. Appendix D describes the directory structure of the compact disc—read-only memory (CD-ROM) physical medium that the DDF will use for distributing ISTP data. Appendix E provides the formats for POLAR wideband data.

Note: The transfer list used to transfer data files from the GTDM DCF to the CDHF and between the CDHF and the DDF is documented in ICD Between the ISTP CDHF, the Generic Data Capture Facility (GDCF), and the DDF (Reference 2). This DFCD documents the formats of the data files transferred from either the CDHF or the DDF to the ISTP investigators. This DFCD also documents the formats of most of the data files transferred from the GTDM DCF to the CDHF and between the CDHF and the DDF.

Table 1–2. ISTP Mission Experiments (1 of 3)

Experiment	Mission	Lead Investigators	Country/Organization
Plasma Wave Instrument (PWI)	GEOTAIL	Dr. H. Matsumoto	Japan/Kyoto University
High-Energy Particles (HEP)	GEOTAIL	Dr. T. Doke	Japan/Waseda University
Magnetic Field (MGF)	GEOTAIL	Dr. S. Kokubun	Japan/University of Tokyo
Low-Energy Particles (LEP)	GEOTAIL	Dr. T. Mukai	Japan/Institute of Space and Astronautical Science (ISAS)
Electronic Field Detector (EFD)	GEOTAIL	Dr. K. Tsuruda	Japan/ISAS
Energy Particles and Ion Composition (EPIC)	GEOTAIL	Dr. D. Williams	U.S./Applied Physics Laboratory (APL)
Comprehensive Plasma Instrumentation (CPI)	GEOTAIL	Prof. L. Frank	U.S./University of Iowa
Radio Plasma Wave Experiment (WAVES)	WIND	Dr. J. Bougeret	France/Laboratorie de Recherche Spatiale Observatoire
Energetic Particle Acceleration Composition Transport (EPACT)	WIND	Dr. T. Von Rosenvinge	U.S./Goddard Space Flight Center (GSFC)

Table 1–2. ISTP Mission Experiments (2 of 3)

Experiment	Mission	Lead Investigators	Country/Organization
Solar Wind Experiment (SWE)	WIND	Dr. K. Ogilvie	U.S./GSFC
Solar/Wind Suprathermal Ion Composition Studies (SMS)	WIND	Dr. G. Gloeckler	U.S./University of Maryland
Magnetic Field Investigation (MFI)	WIND	Dr. R. Lepping	U.S./GSFC
3-D Plasma Analyzer	WIND	Dr. R. Lin	U.S./University of California, Berkeley (UCB)
Transient Gamma Ray Spectrometer (TGRS)	WIND	Dr. B. Teegarden	U.S./GSFC
KONUS	WIND	Dr. E. Mazets	Russia/IOFFE Physical-Technical Institute
		Dr. T. Cline	U.S./GSFC
Solar Wind Interplanetary Mission (SWIM)	WIND	Dr. E. Cliver	U.S./Phillips Laboratory
		Dr. R. Zwickl	U.S./National Oceanic and Atmospheric Administration (NOAA)
PWI	POLAR	Dr. D. Gurnett	U.S./University of Iowa
Fast Plasma Analyzer (Hydra)	POLAR	Prof. J. Scudder	U.S./University of Iowa
Magnetic Field Investigation (MFE)	POLAR	Dr. C. Russell	U.S./University of California, Los Angeles (UCLA)
Toroidal Ion Mass Spectographs (TIMAS)	POLAR	Dr. E. Shelley	U.S./PARL
Electric Field Instrument (EFI)	POLAR	Dr. F. Mozer	U.S./UCB
Thermal Ion Dynamics Experiment (TIDE)	POLAR	Dr. C. Chappell	U.S./Marshall Space Flight Center (MSFC)
Ultraviolet Imager (UVI)	POLAR	Dr. G. Parks	U.S./University of Washington
Visible Imaging System (VIS)	POLAR	Prof. L. Frank	U.S./University of Iowa
Polar Ionospheric X-Ray Imaging Experiment (PIXIE)	POLAR	Dr. W. Imhof	U.S./PARL
		Dr. D. McKenzie	U.S./AERO
Charge and Mass Magnetospheric Ion Composition Experiment (CAMMICE)	POLAR	Dr. T. Fritz	U.S./Boston University
Comprehensive Energetic Particle Pitch Angle Distribution (CEPPAD)	POLAR	Dr. J. Blake	U.S./AERO
Source/Loss-Cone Energetic Particle Spectrometer (SEPS)	POLAR	Dr. H. Voss	U.S./Taylor University

Table 1–2. ISTP Mission Experiments (3 of 3)

Experiment	Mission	Lead Investigators	Country/Organization
Charge, Element, and Isotope Analysis System (CELIAS)	SOHO	Dr. D. Hovestadt Dr. P. Boschler	Germany/Max Planck Institut Switzerland/University of Bern
Comprehensive Suprathermal and Energetic Particle Analyzer (COSTEP)	SOHO	Dr. H. Kunow	Germany/Institut fuer Reine und Angewandte Kernphysik
Energetic and Heliospheric Relativistic Nuclei and Electron Experiment (ERNE)	SOHO	Dr. J. Torsti	Finland/University of Turku

Table 1–3 lists the ISTP ground-based and theory investigations and their lead investigators.

Table 1–3. ISTP Ground-Based, Theory, and Other Investigations

Investigations	Mission	Lead Investigators	Organization
Dual Auroral Radar Network (DARN)	GBI	Dr. R. Greenwald	U.S./APL
Sondre Stromfjord Radar (SONDRESTROM)	GBI	Dr. J. Kelly	U.S./SRI International
CANOPUS Instrumentation	GBI	Dr. G. Rostoker	Canada/University of Alberta
SESAME Instrumentation	GBI	J. Dudeney	U.K./British Antarctic Survey (BAS)
Ionospheric-Magnetospheric Coupling (IMC)	THEORY	Dr. M.Hudson	U.S./Dartmouth College
Solar Wind Magnetospheric Coupling (SWMC)	THEORY	Dr. D. Papadopoulos	U.S./University of Maryland
Total Energy Deposition (TED)	THEORY	Dr. M. Rees	U.S./University of Alaska
Substorm Simulation (SS)	THEORY	Dr. M. Ashour-Abdalla	U.S./UCLA
MFE (X-40)	IMP-8	Dr. R. Lepping	U.S./GSFC
PWI (X-53)	IMP-8	Dr. L. Lazarus	U.S./MIT
Geostationary Operational Environmental Satellite (GOES)	GOES	Dr. R. Zwickl	U.S./NOAA
Los Alamos National Laboratory (LANL)	LANL	Dr. D. McComas	U.S./LANL

1.7 Overview of Interface

This DFCD is applicable to the following ISTP interfaces:

- CDHF to investigator RDAF
- DDF to investigator RDAF
- GDCF to CDHF
- CDHF to DDF
- GDCF to DDF

The CDHF to investigator RDAF interactive interface provides the following data:

- Remote users at the RDAFs with a complement of standard CDHF interactive services for reviewing the data catalog, transferring data files, qualifying key parameters, and coordinating with others through electronic mail and a bulletin board
- Support in the form of documentation standards, utility software, KPGS development accounts, and configuration management procedures for use by investigators in developing KPGS programs at the RDAF and delivering them to the CDHF for production use
- The capability to transfer KPGS to the CDHF via electronic means

The interactive service interface is implemented through National Aeronautics and Space Administration (NASA) Science Internet (NSI) and CDHF-resident interactive menu software. NSI is a DEC network (DECnet) and Transmission Control Protocol/Internet Protocol (TCP/IP)-based wide area network linking the CDHF and all investigator RDAFs.

The following data items are transferred interactively from the CDHF to the ISTP investigators:

- Level-zero data to investigators of the experiment onboard the respective spacecraft
- GEOTAIL Scientific Information Retrieval Integrated Utilization System (SIRIUS)-formatted instrument data to ISAS and to GEOTAIL PIs and Co-Is
- Spacecraft housekeeping data to investigators of experiments onboard the spacecraft
- Key parameters for all experiments to all investigations
- Predictive and definitive orbit data to all investigations
- Predictive and definitive attitude data to all investigations
- Spacecraft command history data to all investigators responsible for the instrument aboard the respective spacecraft
- Redistribution of lost or unreadable data to the appropriate investigators
- Forced distribution to PIs before normal distribution time
- Ad hoc distribution data not included in normal distribution
- SOHO summary, command history, TCF, and SDR data to SOHO investigators

The DDF organizes the above types of data for distribution and writes them to physical media that are mailed with an accompanying, computer-generated mailing letter detailing the contents to scientific investigators.

Initially, the DDF distributed data on only nine-track, 6250-bits per inch (bpi) magnetic tapes. The tapes are American National Standards Institute (ANSI) standard-labeled tapes, which include HEADER3. The DDF has begun distributing data on CD-ROM physical media. Magnetic tape continues to be available as an alternative data distribution medium.

The GTDM DCF to the CDHF interface provides the level-zero, SIRIUS, and spacecraft housekeeping data. The CDHF-resident KPGS uses the level-zero and SIRIUS-formatted telemetry data for generating key parameters.

The CDHF to the DDF interface provides the following:

- Level-zero data
- SIRIUS-formatted data
- Spacecraft housekeeping data
- Key parameters for all experiments
- Predictive and definitive orbit data
- Predictive and definitive attitude data
- Spacecraft command history data
- Spacecraft quality and accounting (Q/A) data

The GTDM DCF to the DDF interface provides the following:

- POLAR wideband data
- ISTP plotting subsystem (IPLOT) data

SECTION 2—ISTP DATA FORMAT OVERVIEW

This section provides an overview description of the general format of the data files distributed from either the CDHF or the DDF to the scientific community of PIs, Co-Is, GBIs, and TIs. To facilitate understanding, this section includes background information and conceptual and descriptive information on the standard formatted data units (SFDUs). It also introduces the concept of a common format.

2.1 Background and Scope

Note: The following two paragraphs were extracted from Reference 3.

A critical function of the ISTP Ground Data Processing System (GDPS) is the management of the data products ingested, computed, and distributed by the system. At the outset, it was recognized that these products should be self-documenting and, where possible, use existing standards and schemes for data mamagement.

SFDUs have been chosen as the first level of management for the data products. A detached SFDU file is used to identify and describe each ISTP data product. These SFDU files consist of American Standard Code for Information Interchange (ASCII) metadata (data that describes data) about and pointers to the actual data products. The SFDU standard is defined and operated under the auspices of the Consultative Committee for Space Data Systems (CCSDS). SFDUs operate by "labeling" data (or metadata) objects with 20-byte SFDU labels. The data product described by the SFDU is registered with a control authority (CA). The CA used for the ISTP program is the National Space Science Data Center (NSSDC). Each registered data product has a unique registration number. SFDUs are constructed so that they are easy to view with standard computer tools (e.g., "TYPE" or "cat" commands.)

Note: SFDU headers for SOHO data files differ with respect to file-naming conventions and the REFERENCETYPE parameter depending on whether the data file is processed/used by the ISTP CDHF. This issue and which data files have which convention is discussed in Section D.1 of Appendix D.

Reference 4, although not a final standard, documents the construction rules. The SFDU concepts provide the protocols needed to enable the transformation of the discipline-oriented data used today into a distributed worldwide scientific information repository for the future.

On a multimission, multi-instrument program such as the ISTP, there is a need to correlate or merge science data from multiple instruments and multiple missions. Such correlation is very difficult unless there is some commonality with respect to format and field definitions/descriptions.

The use of SFDU methodology ensures that the description of data format and data content is either contained with the data itself or can be readily obtained from a control authority. This methodology, however, does not resolve the problem of correlating or merging the science data from multiple instruments and missions.

To address this need, the ISTP/Global Geospace Science (GGS) data committee strongly recommended that distribution data files for key parameters, definitive parameters, and event data share a common data format and a common data dictionary.

The common data dictionary would provide the means to ensure that identical data items are described identically with respect to format, units of measurement, etc. This dictionary in combination with a common data format that is consistent with the CDHF operational concepts and design is intended to facilitate the correlation and merging of the data from multiple ISTP experiments.

By combining the structural, identification, labeling, and registration aspects of the SFDU methodology with the concept of a computer software-interpretable common data format and content description language, a self-documenting, self-describing dataset can be produced within the constraints of the CDHF design. In addition, the common data format support software must be available off the shelf, must have maintenance support, and must be portable to those computers likely to be used within the ISTP program.

It was decided at the April 1991 Science Working Group meeting that the NSSDC's common data format (CDF) is to be used for key parameter, orbit, and attitude data. Through use of the NSSDC-supplied CDF software, the CDHF provides the key parameter, orbit, and attitude data files in machine-independent, external representation. The investigators use NSSDC-provided CDF support utilities to convert the data from external representation to the native format of their facilities.

The CDHF provides an online catalog service for investigator's usage in accessing ISTP data prior to its availability from the DDF. Files containing data descriptions about the organization of the scientific data may also be requested. The data descriptions are associated with data dictionaries that contain semantic information about the variables in the datasets.

2.2 ISTP Data Format Overview

This section provides essential properties of the ISTP data formats with respect to data management, an initial recommendation for ISTP data formats, related elements of the SFDU standard, aspects of the SFDU standard, and SFDU control authority and registration.

2.2.1 ISTP Data Format Requirements

ISTP data is transferred to various types of hardware, combined for science purposes, and archived for retrieval and further analysis many years into the future. To support these purposes, the ISTP data format and associated software must provide and/or support the following basic services:

- Data management, including precise and complete data annotation
- Conceptual model and software interface for storage of and access to flat, multidimensional data and associated metadata for application software development
- Software interface to allow byte-level data access in support of user-written special application software
- Existing and available support software that searches and selects data or metadata across time, instrument, and spacecraft boundaries and provides for efficient merging of such disparate data/metadata within the common format
- A generic, user-friendly applications interface to access and display such data and metadata
- Frame portability among the various computers used by the ISTP scientific investigators

The ISTP data format must support data management by providing the ability to

- Identify distinct collections of data
- Characterize them with certain attributes
- Store and retrieve specific data collections on the basis of those attributes

- Transfer data collections and attributes to other, including heterogeneous, computer systems where they may be similarly managed

The ISTP data format must have the following properties in order to support ISTP data management:

- The physical media, physical format, data format and related software must be supported (and must be likely to continue to be supported) for the life of the ISTP collaborative science data analysis (estimated to continue past the year 2005)
- The format must support the management of the full range of ISTP data products (e.g., key parameters, event, other) and of the related format and content metadata
- The format must be compact and efficient in its use of storage (e.g., minimal overhead for data management services)
- The format must facilitate access to the data contents ("including the bits") both within an individual data collection or logical file and across related data collections
- The format and its support software must facilitate data transfer between several computer architectures and platforms likely to be used by the ISTP investigative community (e.g., VAX/VMS, Sun, Apple Macintosh)

2.2.2 SFDU Standard for ISTP Data Formats

The SFDU approach was adopted as the highest level ISTP data format standard because the SFDU

- Is to be an international standard with growing acceptance throughout the space sciences community
- Supports basic data management functions
- Provides a framework for basic data interchange functions
- Provides a standard to consistently encapsulate all levels of ISTP data
- Provides procedures for the registration and dissemination of data definitions and descriptions
- Provides a standard way to link data to its description

2.2.3 SFDU Concepts

Fundamentally, the SFDU concept is a self-documenting labeling scheme that incorporates a registration identifier in the label. The registration identifier corresponds to a collection of metadata ("data about data") that defines the data format and its content.

Rather than being a standard format into which one puts data, the SFDU concept focuses on standard data labeling to enhance the understanding of transmitted and stored data. The data may be in any user-defined arrangement that can be expressed precisely.

Information transfer ranges from single data elements to completely identified and defined products. A data element is an individually named data item that is used in a processing algorithm as a singular data parameter, variable, or attribute. Elements are collected and structured into data objects (aggregations of elements).

2.2.3.1 SFDU Structure and Construction Rules

The role of the SFDU structure and construction rules is to define standard methods for

- Labeling and delimiting data objects
- Aggregating, collecting, and structuring sets of data objects to allow the use of standard packaging and unpackaging techniques
- Indicating the major type of data or metadata within a data object

Figure 2–1 presents an example of a data product. A “complete” data product typically comprises one or more “parts” containing the data, the information describing the data formats and representation, data element dictionaries, and cataloging information. In addition to the SFDU label for the entire data product, typically each part (e.g., format description) begins with its identifying SFDU label. This allows descriptive parts (e.g., format description or data dictionaries) to be omitted optionally to reduce overhead because the descriptive material is retrievable from the CCSDS member agency CAs using the unique identifier contained within the label.

SFDU Label (note:)	•
Content Identification Object (Catalog Information)	• DATA
Format Description	PRODUCT
Data Dictionary	•
Application Data	•

Note: SFDU label for the entire volume (product)

Figure 2–1. Data Product

2.2.3.2 SFDU Control Authority and Registration

The SFDU methodology promotes documentation rigor through the administrative services provided by the CCSDS member agency CAs, the focal points for the acquisition, registration, and maintenance of metadata. The data registration procedures provide a global data identification mechanism, which combined with standard data labeling and conventions for the aggregation of modular data objects, enables the comprehensive self-identification process needed to support data interchange and archiving.

CCSDS, the originator of the proposed SFDU standard, has defined a hierarchy of member agency CA offices for the registration, maintenance, and control of data product descriptions. Data formats, data dictionaries, and any supplementary information (such as spacecraft and instrument descriptions) are registered with a CA. The CA assigns an authority and description identifier (ADI) that uniquely identifies the data product that was registered.

2.3 SFDU Structure

This section presents the SFDU structure. An SFDU can consist of either a single (called basic) SFDU or a nested SFDU made up of multiple basic SFDUs. Nesting SFDUs provides flexibility in their use. This section describes both the basic SFDU and the nested SFDU.

2.3.1 SFDU Structure—Basic

The basic SFDU structure is called the Label-Value-Object (LVO). The LVO is the fundamental structural element used to build SFDUs. An LVO, as shown in Figure 2–2, contains two fields: a 20-byte label field followed by a variable-length value field. Depending on the label-field values, the LVO may contain a marker to indicate the end of the SFDU.

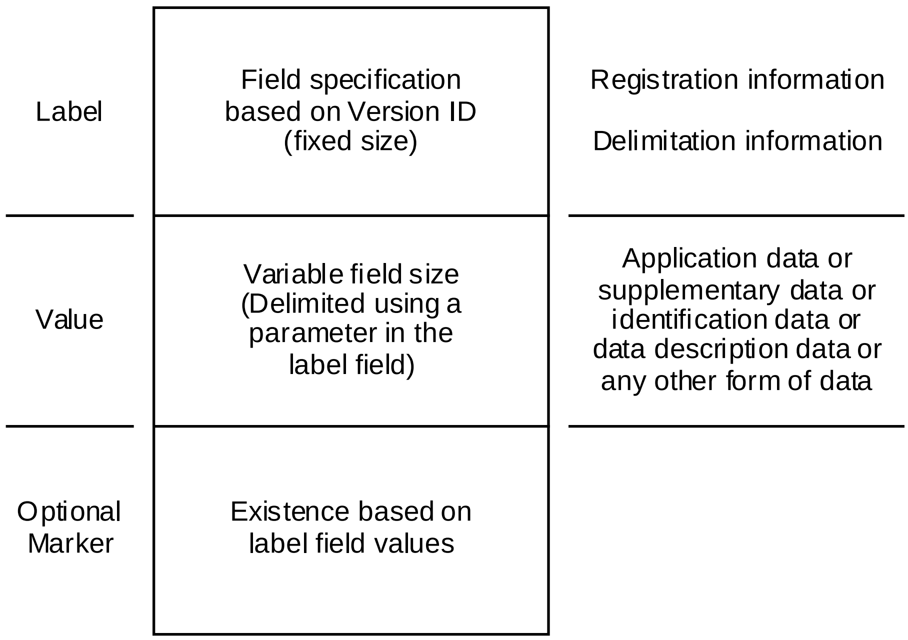


Figure 2–2. Label-Value-Object (LVO) Structure

Figure 2–2 illustrates a schematic of an SFDU (LVO) and shows the kind of information found within both the label field and the value field.

2.3.2 Label Subfields

The label field provides the CCSDS CA registration information and specifies how the value field is delimited. The label field contains the following subfields:

- Control authority identifier (CAID)
- Version
- Class
- Spare/delimitation type
- Spare bytes
- Data description identifier (DDID)
- Delimitation parameter

Figure 2–3 presents an example of an SFDU label. The figure shows the byte position and possible contents of each label subfield. The figure also provides concise descriptions of the subfield contents.

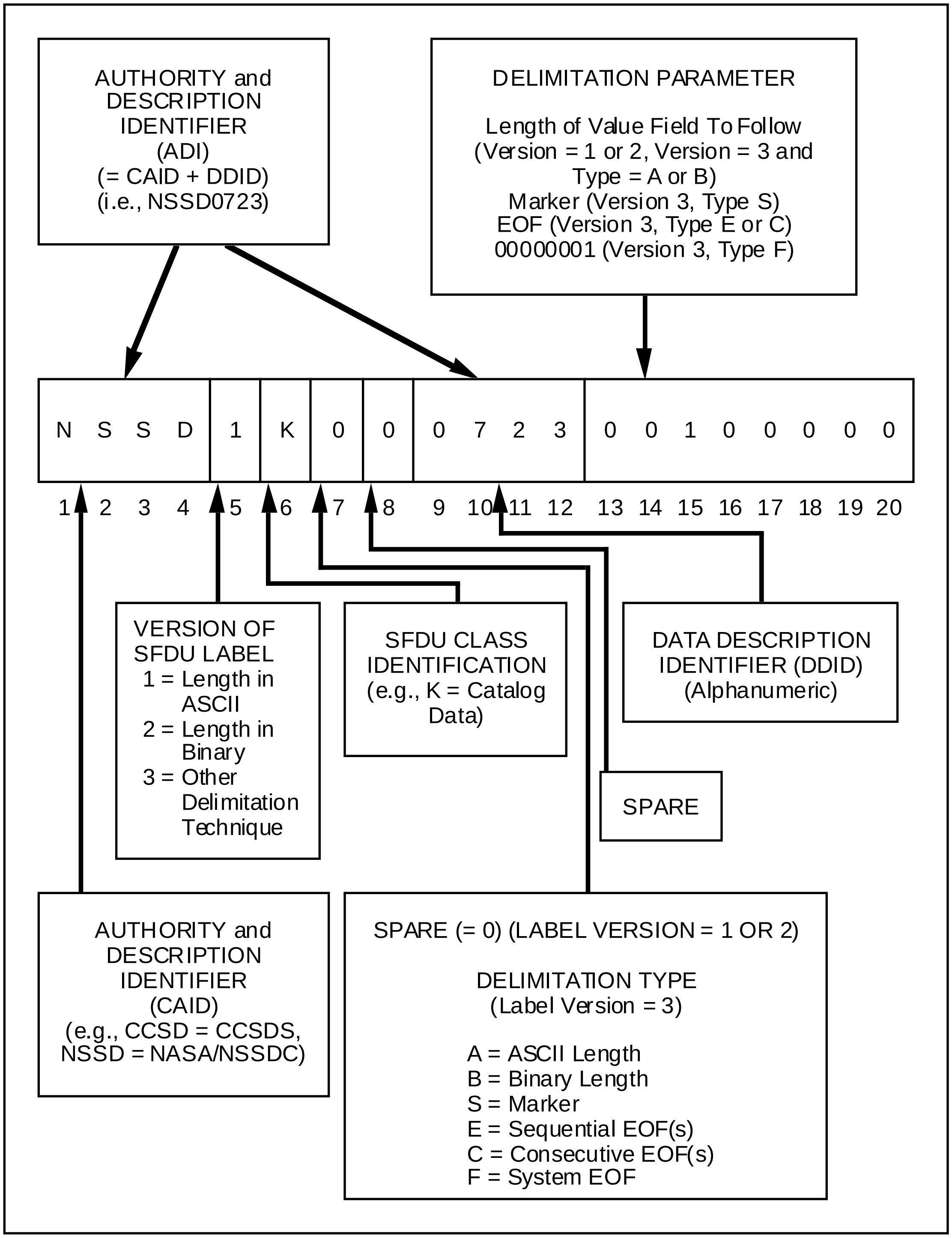


Figure 2–3. SFDU Label

Table 2–1 identifies the byte-position of each subfield in the label. Reference 4 defines each of the subfields in detail.

Table 2–1. Label Subfields

Bytes	Subfield
1–4	Control Authority Identifier (CAID)
5	Version
6	Class
7	Spare/Delimitation Type
8	Spare bytes reserved for future use (SP)
9–12	Data Description Identifier (DDID)
13–20	Delimitation Parameter

The values entered in the label subfields are represented using a restricted ASCII (RA) character set. The valid characters are 0–9 and uppercase A–Z. Each valid character, with its decimal, binary, and hexadecimal equivalent, is listed in Reference 4. (Note that the delimitation parameter subfield may contain other than an ASCII value.)

The following sections briefly define the label subfields.

2.3.2.1 Control Authority Identifier and Data Description Identifier

Two of these subfields are the CAID and the DDID. The CAID, in bytes 1–4, identifies the CCSDS member agency CA office that maintains the format definition (has registration responsibility for the data description information). The DDID, in the last 4 bytes (bytes 9–12), combined with the CAID, uniquely identifies the data definition information that applies to the Value field data. Together, the CAID and DDID make up the ADI, a globally unique name for the Value field description.

2.3.2.2 Version

The 1-byte version subfield in byte 5 indicates the label version with respect to how the end of the value field is determined. There are two basic ways for this as follows:

- The value-field length is provided in the label.
- The end of the value field is denoted by a delimiter.

The version subfield can have three possible values as follows:

Version	Meaning
1	The delimitation parameter contains the value field length in ASCII (1 to 8 bytes, as applicable)
2	The delimitation parameter contains the value field length in binary (64-bit unsigned integer with leading zero bits as needed)
3	A delimitation technique other than specifying the length is being used (see delimitation type)

The delimitation parameter contains a length value when version equals either “1” or “2.” Table 2–2 should serve to clarify the length representation with respect to the version value.

Table 2–2. Length Representation With Respect to Version Value

Decimal Value	Hexadecimal Value	Version = 1	Version = 2
		Decimal ASCII	Binary
25	19	3235	0000 0000 0001 1001
10	A	3130	0000 0000 0000 1010
100	64	313030	0000 0000 0110 0100
1000	3E8	31303030	0000 0011 1110 1000

2.3.2.3 Class

The class subfield in byte 6 is used to classify the content of the value field. There are three categories of classes: structure, service, and data. The class IDs by category are listed, and the classes are described in detail in Reference 4.

2.3.2.4 Delimitation Type

This subfield, in byte 7, is used to specify the type of value field delimitation when label version equals “3.” Otherwise (if version equals either “1” or “2”), this subfield is a null-filled spare. The delimitation type indicators and associated descriptions are as follows:

Delimitation Type	Description
A	ASCII Length
B	Binary Length
S	Marker
E	Sequential end-of-file (EOF) marker(s)
C	Consecutive EOF marker(s)
F	System EOF

Note that ASCII length or binary length can be specified in two different ways. ASCII length can be denoted by either version = “1” or version = “3” and type = “A”. Binary length can be denoted by either version = “2” or version = “3” and type = “B”.

2.3.2.5 Spare

Byte 8 is a spare byte reserved for future use.

2.3.2.6 Delimitation Parameter

The 8-byte delimiter parameter is in bytes 13–20. The meaning of its contents depends on version and delimitation type as shown in Table 2–3.

Table 2–3. Delimitation Parameters

Version	Delimitation Type	Delimitation Parameter Content
1	N/A	ASCII Length
2	N/A	Binary Length
3	A	ASCII Length
3	B	Binary Length
3	S	Marker
3	E/C	EOF Count
3	F	00000001

2.3.3 Value Field

While the label subfields are restricted as to structure and representation, the variable-length value field can be varied in terms of its internal structure and representation. The value field may contain any of the following:

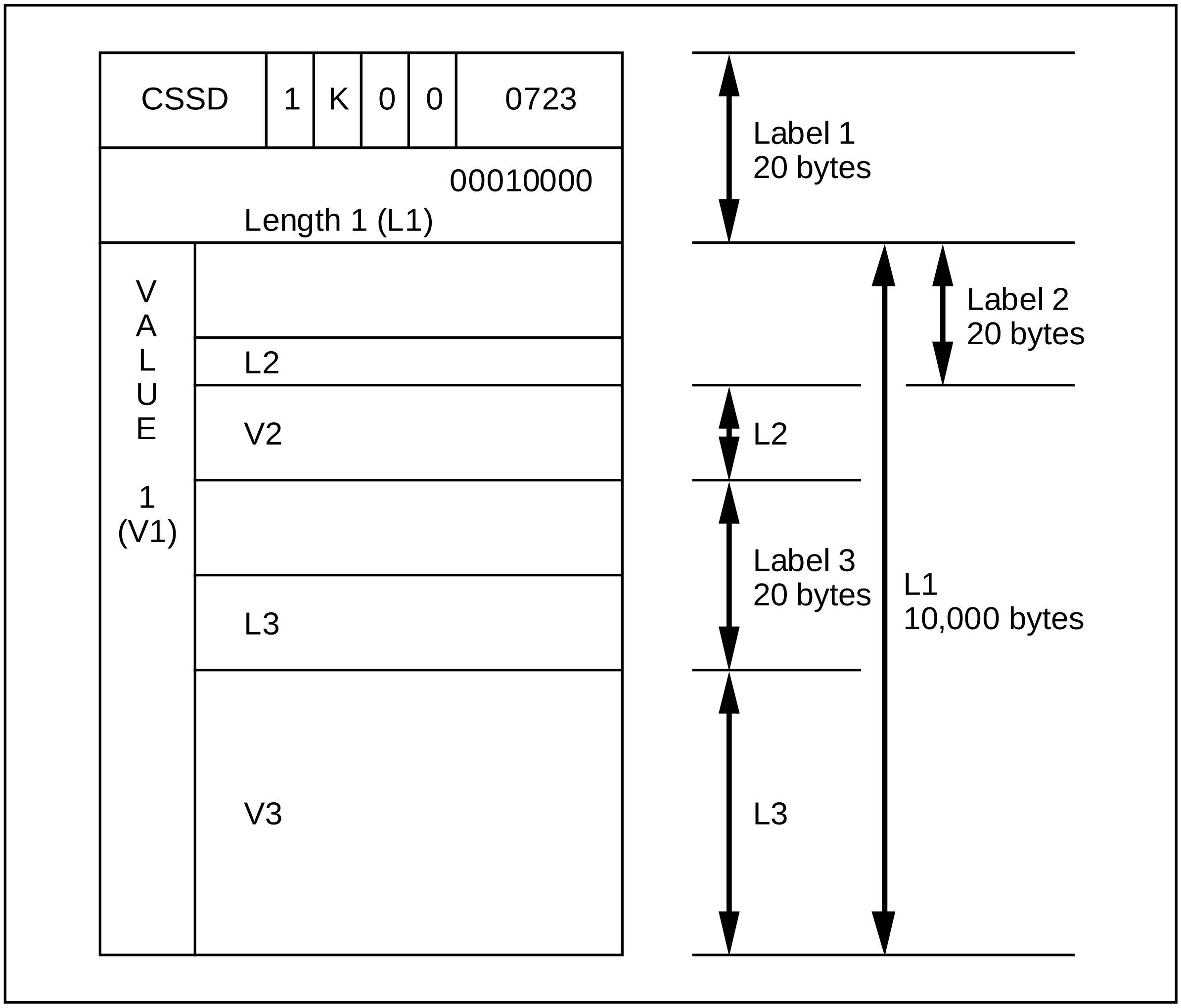
- Application data
- Application data and information (metadata)
- Data description information (format and content description)
- Supplementary information
- Identification information
- Other forms of data
- LVOs (SFDUs)

2.3.4 SFDU Structure—Nested

The value field may contain data or one or more LVOs that must be decoded to obtain the actual data. Figure 2–4 depicts a nested or multi-level LVO in which two LVOs, LVO 2 and LVO 3, are enveloped within the top-level LVO, LVO 1. In this example, the top-level value field (V1) contains LVOs 2 and 3. Note that the delimitation parameter subfield of each label encompasses its value field and that L1, the length of V1, contains a value equal to the combined lengths of the inner LVOs (L2 + L3 + 40).

The fact that the LVO is nested can be determined by analyzing the length fields in the labels.

This ability to nest or aggregate LVOs provides for considerable flexibility in structuring SFDU files.



Note: V1 is L1 (10,000) bytes long. Likewise, V2 is L2 bytes long; V3 is L3 bytes long. The three labels (Label 1, Label 2, and Label 3) each contain 20 bytes, as do all SFDU labels. L2 + L3 + 40 (the combined lengths of Labels 2 and 3) = 10,000. Therefore, V2 + V3 contain 9,960 line (i.e., 10,000-40) bytes.

Figure 2–4. Nested LV Object (SFDU)

2.4 SFDU in the ISTP CDHF

The CDHF requires that all files managed by the CDHF system have ISTP SFDUs associated with them. The CDHF Data Management System uses the ISTP SFDUs to identify the data files, and describe their contents. Although the CDHF design can support either attached or detached ISTP SFDUs, all files currently managed by the CDHF have detached ISTP SFDUs. All detached ISTP SFDUs within the CDHF have the file extension ".SFDU". The ISTP SFDU files are formatted to be easily viewable at a terminal. They may be typed out using the VMS TYPE command or viewed by using a text editor or by using the DISPLAY_SFDU command. This section describes the format and content of the ISTP SFDUs used by the CDHF for ISTP data files.

2.4.1 CDHF SFDU Structure

The detached ISTP SFDUs used by the CDHF consist of 512-byte, fixed-length records. The unused portion of any record is blank filled. Each ISTP SFDU consists of the appropriate SFDU labels, a contents identifier object (CIO), and a reference object.

The CIO is in keyword = value format and contains identifying or descriptive information such as project name, data type (e.g., level-zero), start and stop times, etc.

2.4.2 Parameters in the CIO

Parameters within the CIO are packed into the 512-byte records, in the form of parameter/value strings, separated by semicolons (;). In addition, to allow the CIO to be easily listed to a terminal screen, a carriage return and line feed (CR LF) is placed after each semicolon. This causes each parameter to appear on a separate line when listed to the terminal with standard listing tools such as the VAX/VMS TYPE command or the UNIX “cat” command. Parameter/value strings are not wrapped between records. If a parameter/value string will not completely fit in an existing record, the record is blank filled and the string is written to the beginning of the next record. This means that a single parameter/value string may not exceed 510 bytes in length (510 bytes plus the 2-byte CR LF equals the 512-byte record length).

A general set of parameter names for the CIO has been derived from the Directory Interchange Format Manual, Version 3.0, December 1990 NASA GSFC, NSSDC. These have been supplemented with the additional parameters needed to describe the ISTP data files fully. Some parameters have multiple values (i.e., both a short and a long name). In these cases, the values are separated by a “>.” The ADI number assigned by the NSSDC to the CIO used for ISTP data is NSSD0060. This information appears in the 20-byte SFDU label.

The valid parameters for an ISTP SFDU CIO are listed below. Required parameters are so indicated.

Project (required)
Discipline (required)
Source_name (required)
Data_type (required)
Descriptor (required)
Start_date/Stop_date (required)
Data_Version (required)
ICSS_release (optional)
Generation_date (optional)
Generation_program (optional)
File_id (optional)
Input_file (optional)
Comment (optional)
Begin_group/End_group (optional)

A detailed description of each parameter is provided in the following subsections.

2.4.2.1 Project (required)

The Project parameter specifies the name of the project. Both a short and a long name are provided. This string must be enclosed within double quotation marks (“ ”). For ISTP missions and investigations the value used is ISTP>International Solar-Terrestrial Physics. For example:

Project = “ISTP>International Solar Terrestrial Physics”;

2.4.2.2 Discipline (required)

The Discipline parameter describes the science discipline and subdiscipline. This string must be enclosed within double quotation marks (“ ”). Unlike the discipline, the subdiscipline is not required. The values for ISTP data are as follows:

Space Physics>	Interplanetary Studies Ionospheric Science Magnetospheric Science
Solar Physics>	Gamma Ray Observations Infrared Observations Microwave Observations Radio Observations Ultraviolet Observations Visible Observations X-Ray Observations

For example:

Discipline = “Space Physics>Magnetospheric Science”;

2.4.2.3 Source_name (required)

The Source_name parameter identifies the mission or investigation that contains the sensors. This string must be enclosed in double quotation marks (“ ”). For ISTP this is the mission name for spacecraft mission ground-based or theory investigations. Both a long name and a short name are provided. Valid Source_name values for ISTP are as follows:

CANOPUS>Canadian Auroral Network Open Program Unified Study
CLUSTER>Plasma Turbulence Laboratory
DARN>Dual Auroral Radar Network
GEOTAIL>Geomagnetic Tail
GOES>Geostationary Operational Environmental Satellite
IMP8>Interplanetary Monitor Platform
LANL>Los Alamos National Laboratories
POLAR>Polar Plasma Laboratory
SAMPEX>Solar Anomalous and Magnetospheric Particle Explorer
SESAME>Satellite Exploration Simultaneous with Antarctic Measurements
SL>Solar Terrestrial Environment Laboratory, Nagoya University
SOHO>Solar Heliospheric Observatory
SONDRESTROM>Sondrestrom Incoherent-Scatter Radar
WIND>Wind Interplanetary Plasma Laboratory

For example:

Source_name = “GEOTAIL>Geomagnetic Tail”;

2.4.2.4 Data_type (required)

The Data_type parameter identifies the data type of the data file associated with the CIO. Both a long name and a short name are given. This string must be enclosed within quotation marks (“ ”). Valid names for ISTP are as follows:

AN>Ancillary Data
AR>As-Run Plan
AT>Attitude
CD>Calibration Data
CH>Command History
Kx>Key Parameter (x is a number from 0 to 9)
LZ>Level-Zero
PA>Platform Attitude
PP>Prime Parameters
OR>Orbit
QL>Level-Zero Quicklook
SD>SIRIUS
SP>Summary Parameters
SU>Summary
WA>Working Attitude
WO>Working Orbit

For key parameter data types, 1 to 10 separate key parameter files can be derived from the same input telemetry file. Separate files are used in cases where sets of key parameters are generated that cannot be efficiently combined in a single file. An example of this is sets of key parameters generated at different time intervals. For example:

Data_type = “K0>Key Parameter”;

2.4.2.5 Descriptor (required)

The descriptor identifies the name of the instrument or sensor that collected the data or further identifies the type of data. Both a long name and a short name are given. Valid values for the short name and the associated long name are listed in Section 2.6 and can be found in the CDHF catalog. For example:

Descriptor = “VIS>Optical Auroral Imager”;
Descriptor = “PRE>Predicted Data”;

2.4.2.6 Start_date/Stop_date (required)

These parameters contain the first and last dates and times of the data associated with the SFDU. Dates and times are specified in a form compatible with International Organization for Standardization (ISO) 8601. All dates and times for ISTP are given as a date with universal time coordinated (UTC). This is indicated by the ‘Z’ following the time field. Times are given to second and decimal fractions of seconds. If the SFDU references multiple data files, the Start and Stop times in the CIO represent the earliest start and latest stop times for the data files in the group. For example:

Start_date = 1993–06–12T13:05:22.0Z;
Stop_date = 1993–06–12T23:59:45.5Z;

2.4.2.7 Data_version (required)

The Data_version parameter indicates the version of the data file or data file group associated with this SFDU. Data_version starts at ‘1’ and is incremented for each subsequent generation of the data. For example:

Data_version = 2;

2.4.2.8 Generation_date (optional)

The Generation_date parameter contains the date and time when the data was generated. In the case of data received by the CDHF, this is the date and time the data was created by the originator. For data files generated by the CDHF (e.g., key parameter files), this is the date and time of creation on the CDHF. Dates and times are specified in a form compatible with ISO 8601. All dates and times for ISTP data are given as a date with UTC time. This is indicated by the ‘Z’ following the time field. Times are given in seconds. For example:

Generation_date = 1993–06–12T14:25:27.0Z;

2.4.2.9 Generation_program (optional)

The Generation_program parameter identifies the program that generated the data file. Both the name and version of the program should be identified. For example:

Generation_program = WI_WAV_KPG_V1.2;

2.4.2.10 File_id (optional)

The File_id parameter identifies the SFDU and the data file or data file group associated with the SFDU. Both the SFDU and the data files in the group should have this parameter incorporated internally (the SFDU, as part of the CIO and the data files as part of their embedded metadata-data). The CDHF convention for naming data files and their associated detached SFDUs is to give data files and SFDU files the same filename with different extensions. File_id serves as a mechanism independent of the physical filename to associate an SFDU with a specified data file. For example:

File_id = PO_K0_UVI_19960914_V01;

The above example would identify the following physical files:

PO_K0_UVI_19960914_V01.SFDU
PO_K0_UVI_19960914_V01.DAT

2.4.2.11 Input_file (optional)

The Input_file parameter identifies the input files (if any) that were used to create the data file associated with this SFDU. This parameter may appear as many times as there are input files. For example:

Input_file = PO_LZ_UVI_19960914_V01;
Input_file = PO_OR_PRE_19960914_V01;
Input_file = PO_AT_PRE_19960914_V01;

2.4.2.12 Comment (optional)

The Comment parameter allows the insertion of comments in the SFDU and may appear as many times as desired. Each comment must be enclosed within quotation marks (“ ”). For example:

```
Comment = “Instrument turned off between 0800 and 1430”;
```

2.4.2.13 Begin_group/End_group (optional)

These parameters are used to delimit parameter groups within a single CIO, for example when multiple CIOs are merged to form a single SFDU. The value of the parameter identifies the grouping. The same value must be assigned to the Begin_group/End_group pair that delimits a grouping.

2.4.2.13.1 CIO Group

The CIO group is used to concatenate multiple CIOs into a single SFDU when multiple data files are concatenated to form a single data file. This preserves the information contained in the SFDU for each of the concatenated data files. For example:

```
Begin_group = CIO;
    Project = “ISTP>International Solar Terrestrial Physics”;
    Discipline = “Space Physics>Ionospheric Studies”;
    Source_name = “POLAR>Polar Plasma Laboratory”;
    Data_type = “K0>Key parameter”;
    Descriptor = “VIS>Optical Auroral  Imager”;
    Start_date = 1996–09–14T13:05:22.3Z;
    Stop_date = 1996–09–14T23:59:45.7Z;
    Data_version = 1
    Generation_date = 1996-06-16T14:25:27.0Z;
    File_id =  PO_KP_UVI_19960914_V01;
    Input_file = PO_LZ_UVI_19960914_V01;
    Input_file =  PO_OR_PRE_19960914_V01;
    Input_file =  PO_AT_PRE_19960914_V01;
End_group = CIO;

Begin_group = CIO;
    Project = “ISTP>International Solar Terrestrial Physics”;
    Discipline = “Space Physics>Ionospheric Studies”;
    Source_name = “POLAR>Polar Plasma Laboratory”;
    Data_type = “K0>Key parameter”;
    Descriptor = “VIS>Optical Auroral Imager”;
    Start_date = 1996–09–15T00:04:02.1Z;
    Stop_date =  1996–09–15T23:59:15.3Z;
    Data_version = 1;
    Generation_date =  1996–09–17T12:35:21.0Z;
    File_id = PO_KP_UVI_19960915_V01;
    Input_file = PO_LZ_UVI_19960915_V01;
    Input_file = PO_OR_PRE_19960915_V01;
    Input_file = PO_AT_PRE_19960915_V01;
End_group = CIO;
```

2.4.2.13.2 REFDES Group

The REFDES group is a reference file description group. It is used to provide additional information on each of the files listed in the REFERENCE parameter of the reference object (see Section 3.6.3.2). The parameters in the CIO apply to the set of files listed in the Reference Object. The REFDES group is useful in instances where start and stop dates for individual files are different (e.g., for SIRIUS data file groups).

The REFDES group consists of three parameters repeated as many times as there are files listed in the REFERENCE parameter. These parameters are as follows:

Ref_file	This parameter identifies the file to which the following parameters apply. Its value exactly matches one of the filenames in the REFERENCE parameter of the Reference object.
Start_date/Stop_date	These parameters have the same meaning as they do in the CIO. Here they refer to the start and stop dates of the file specified by the REF_file parameter.

Example:

```
x1         =  REFDES;
Ref_file   =  GE_SD_NUL_19920922_V01.S01;
Start_date =  1992 – 09 – 22T00:02:42.25Z;
Stop_date  =  1992 – 09 – 22T06:12:37.55Z;
Ref_file   =  GE_SD_NUL_19920922_V01.S02;
Start_date =  1992 – 09 – 22T06:13:22.75Z;
Stop_date  =  1992 – 09 – 22T12:30:36.51Z;
Ref_file   =  GE_SD_NUL_19920922_V01.S03;
Start_date =  1992 – 09 – 22T12:30:44.25Z;
Stop_date  =  1992 – 09 – 22T18:32:17.12Z;
Ref_file   =  GE_SD_NUL_19920922_V01.S04;
Start_date =  1992 – 09 – 22T18:33:12.71Z;
Stop_date  =  1992 – 09 – 22T23:59:58.57Z;
End_group  =  REFDES;
```

This example shows the REFDES group for a SIRIUS data group consisting of four files.

2.4.2.14 ICSS_release (optional)

The ICSS_release indicates the release of the ICSS that generated the SFDU. SFDUs created external to the CDHF will not contain this parameter.

Example: ICSS_release = “Release 5.1”;

2.4.3 Parameters in the Reference Object

The reference object of the SFDU is used to point to the data file or files associated with the SFDU. Parameters in the reference object are inserted in the 512-byte records in the same manner as those in the CIO with the exception that the value of the REFERENCE parameter may span more than one 512-byte record. Each parameter is separated from the next by a semicolon and a CR LF combination.

2.4.3.1 REFERENCETYPE

This parameter identifies the type of reference object. For ISTP the reference object type is defined as ($CCSDS3). The REFERENCETYPE parameter may contain subparameters that are project-defined. Currently, no subparameters are defined for ISTP. For example:

REFERENCETYPE = ($CCSDS3);

2.4.3.2 Label

The label parameter indicates what the label for the data object would have been had the data been attached to this SFDU. The label identifies where the data object ends and defines where the definition for the data object is registered. The ADI number for the data product referred to by the SFDU is contained in the label in bytes 1–4 and 9–12. In the following example, the ADI is in boldface. Appendix D lists the ADI numbers assigned to the ISTP data products. For example:

LABEL = **NSSD**3IE0**0065**00000001;

2.4.3.3 Reference

The REFERENCE parameter identifies the files associated with the SFDU. For the CCSDS3 REFERENCETYPE, the REFERENCE parameter gives the name of the file in a long and a short format. The long form of the name is the name as the file appears on the CDHF. The short form of the name is an 8.3-format name (eight-character filename and three-character extension). The 8.3 form of the filename is the format that is used on the ISO 9660 CD-ROMs. For CCSDS2 SFDUs, the REFERENCE parameter gives the long name of the file only. The CDHF will convert any CCSDS2 SFDUs to CCSDS3 when they are received. All files generated by the CDHF will have CCSDS3 format SFDUs. VMS file version numbers are not included as part of the filename form in the REFERENCE parameter for either CCSDS2 or CCSDS3.

CCSDS2 example:

REFERENCE = (WI_KO_WAV_19940715_V01.CDF);

CCSDS3 example:

REFERENCE = (“$1 = 94071501.CDF, $2 = WI_K0_WAV_19940715_ V01.CDF”);

2.5 SFDU Example for ISTP

Figure 2–5 is an example that illustrates the SFDU concepts as applied to ISTP data files managed by the CDHF. The example is for a Satellite Experiments Simultaneous With Antarctic Measurements (SESAME) key parameter file.

A 20-byte SFDU label is shown at the beginning (first 20 bytes of first line) of the data product. This is the label for the entire SFDU file. The first 12 bytes (CSSD1Z000001) identify the file as an SFDU. Since version (byte 5) equals “1”, the next 8 bytes (00001004) contain the length in bytes of the entire SFDU file less this label. Thus, the SFDU has a length of 1004 bytes plus 20 bytes or 1024 bytes.

The next 20 bytes (last 20 bytes of first line) contain the SFDU label associated with the CIO (NSSD1K00006000000740). The boldface NSSD in bytes 1–4 and 0060 in bytes 9–12 indicate that the description of the contents and format of the content identification is registered with the NSSDC CA with an ADI of NSSD0060. The 8-byte length in the delimitation parameter subfield of this label indicates that the CIO (not counting this 20-byte label) contains 740 bytes.

```
CCSD1Z00000100001004NSSD1K00006000000740
Project = "ISTP > International Solar-Terrestrial Physics";
Discipline = "Space Physics > Magnetospheric Science";
Source_name = "SESAME > Satellite Exploration Simultaneous With Antarctic Measurements";
Data_type = "K0 > Key parameters";
Descriptor = "VLF > VLF/ELF Logger Experiment (VELOX)";
Start_date = 1992-07-06T00:00:35.0Z;
Stop_date = 1992-07-06T23:59:35.0Z;
Generation_date = 1992-07-25T12:47:31.3Z;
Data_version = 1;
Generation program = VLF_CDF.FOR;
File_id = SE_K0_VLF_19920706_V01;
Input_file = SE_K0_VLF_19920706_V01.ASC;
Comment = "Mean omnidirectional logarithmic intensities (dB) at";
Comment = "1 kHz and 3 kHz with 1 kHz bandwidth";
Comment = "Determined each minute. 0 dB corresponds to 10-33(T)2 (Hz)-1";
CCSD1R00000300000224
REFERENCETYPE = ($CCSDS3);
LABEL = NSSD31E0010100000001;
REFERENCE = ("$1 = 92070601.CDF, $2 = SE_K0_VLF_19920706_V01.CDF");
```

Note: This sample is for a CCSDS3 SESAME VLF key parameter file.

Figure 2–5. ISTP SFDU Example

The CIO in this example provides values for the following identifying parameters: project, discipline, source_name, data_type, descriptor, start_ and stop_dates, generation_date, data_version, generation_date, generation_program, file_id, input file, and three freeform comment lines.

CCSD1R00000300000224, the SFDU label for the Reference Object, follows the CIO. The "R" indicates this object contains reference information. The "REFERENCETYPE" specifies the"LABEL" value indicates the definition of the associated data object is registered at the NSSDC with an ADI of NSSD0101. The version = "3", delimitation type = "E" delimitation parameter = "00000001" combination indicates the data object is one file (i.e., is delimited by one EOF mark).

2.6 File-Naming Conventions

The ISTP CDHF uses "long" filenames to convey maximum information in the names. In general, filenames are composed of a concatenation of relevant information that provides for unique identification of a dataset.

An ISTP CDHF filename consists of a logical file identifier and an extension. A period (.) separates the extension from the logical file identifier.

Logical file identifiers are a concatenation of five fields that identify the mission, data type, data descriptor, date, and version of the data file. Each of these fields is separated by an underscore character. Blank characters are not allowed in the file identifier. The fields should be treated as variable-length fields. However, note the following: at this time the allowed values for each individual field with the exception of descriptor are all the same length (e.g., all mission identifiers contain two characters). All current descriptor fields contain three or four characters. The logical file identifier is constructed as follows:

mission_datatype_descriptor_date_version

The fields are defined as follows:

- Mission—Identifies the mission or investigation (e.g., GE for GEOTAIL)
- Datatype—Identifies the type of data (e.g., LZ for level zero)
- Descriptor—Describes or further qualifies the source of the data (e.g., PRE for predictive data)
- Date—Identifies the starting date of the data in the file, in the form YYYYMMDD
- Version—Identifies the version of the data (01–99)

In addition to the logical file identifier, each data file has a file extension associated with it which serves to identify the individual components of a multifile group. A fully specified data file consists of the disk/directory VMS logical, the logical file identifier and the extension. All files in multifile groups have the same logical file identifier but different file extensions.

A few specific examples follow:

GE_LZ_QAF_19920912_V01.SFDU

GE	=	GEOTAIL mission
QAF	=	Quality file
LZ	=	Level-zero data type
19920912	=	Data starting on September 12, 1992
V01	=	Version 1 of this file
SFDU	=	Indicates SFDU file

WI_CH_NUL_19930115_V01.DAT

WI	=	WIND mission
CH	=	Command history data
NUL	=	Field not applicable
19930115	=	Data starting on January 15, 1993
V01	=	Version 1 of this file
DAT	=	Indicates generic data type file

GE_SD_NUL_19920912_V01.S01

GE	=	GEOTAIL mission
SD	=	SIRIUS data type
NUL	=	Descriptor for SIRIUS data is not applicable
19920912	=	Data starting on September 12, 1992
V01	=	Version 1 of this file
S01	=	Indicates segment 1 of the SIRIUS data file group

GE_SD_NUL_19920912_V01.SFDU
GE_SD_NUL_19920912_V01.S01
GE_SD_NUL_19920912_V01.S02
GE_SD_NUL_19920912_V01.S03
GE_SD_NUL_19920912_V01.S04

The above group of files constitutes a multifile group of SIRIUS data files. Note that the logical file identifier is the same for each file in the group. The group consists of a single SFDU file and four data files.

The valid values for each of the fields of the logical file identifier are described in the following list. The Data File Types and Retention Periods form in the Database Interface System always contains the current mission, data type, and descriptor combinations for all active missions. Descriptor values for some missions [e.g., Solar Heliospheric Laboratory (SOHO)] are TBD.

Mission:

C1	= CLUSTER Spacecraft # 1
C2	= CLUSTER Spacecraft # 2
C3	= CLUSTER Spacecraft # 3
C4	= CLUSTER Spacecraft # 4
CL	= CLUSTER Mission
CM	= Clementine
CN	= CANOPUS
DN	= DARN
G6	= GOES 6
G7	= GOES 7
G8	= GOES 8
G9	= GOES 9
GE	= GEOTAIL
I8	= Interplanetary Monitoring Platform (IMP-8)
IN	= Interball-Tail
L0	= LANL 1990_095
L1	= LANL 1991_080
L9	= LANL 1989_046
PO	= POLAR
SE	= SESAME
SL	= Solar-Terrestrial Environmental Laboratory, Nagoya University
SN	= Sondrestromfjord
SO	= SOHO
SX	= Solar Anomalous and Magnetospheric Particle Explorer (SAMPEX)
UL	= Ulysses
WI	= WIND
XX	= All missions

Data Type:

AN	= Ancillary data
AR	= As-run plan
AT	= Attitude
CD	= Calibration data
CH	= Command history
K0-K9	= Key parameters (10 files maximum per instrument)

LZ = Level zero
OR = Orbit
PA = Platform attitude
PP = Prime parameters
QL = Quick look
SD = SIRIUS data
SP = Summary parameters
SU = Summary dataHAN
WA = Working attitude
WO = Working orbit

Descriptor:

DEF = Definitive data
LNG = Long-term predicted
NUL = Indicates field does not apply
PRE = Predicted data

CANOPUS:

ASI = All Sky Imager
BARS = Bistatic Auroral Radar System
MARI = Magnetometer and Riometer Array (MARIA)
MPA = Meridan Photometer Array

CLUSTER:

ASP = Active Spacecraft Potential Control (ASPOC)
AUX = Auxiliary
CIS = CLUSTER Ion Spectrometry Experiment
DWP = Digital Wave-Processing Experiment
EDI = Electron Drift Instrument
EFW = Spherical Probe Electric Field and Wave Experiment
FGM = Magnetic Field Investigation
PEA = Plasma Electron and Current Experiment (PEACE)
RAP = Imaging Energetic Particle Spectrometer (RAPID)
STA = Spatio-Temporal Analysis of Field Fluctuations Experiment (STAFF)
WHI = Sounder and High-Frequency Wave Analyzer Experiment (WHISPER)

DARN:

AARC = Halley/Syowa/Sanae
ALPA = Alaska/Prince Albert
BARS = Bars Very-High-Frequency (VHF) Radar
CTLS = Iceland/Finland (Cutlass)
GBAY = Goose Bay High-Frequency (HF) Radar
GBST = Goose Bay/Stokkseyri
HANK = Hankasalmi (Cutlass/Finland) Radar
ICEW = Iceland West Radar
KAPU = Kapuskasing
PYK = Pykkvybaer (Cutlass/Iceland) Radar
SABR = SABRE VHF Radar
SAKA = Saskatoon/Kapuskasing
SASK = Saskatoon

SHAR = SHARE (Sange Station) Radar
SYOW = Syowa Stations Radar

GEOTAIL:

CPI = Comprehensive Plasma Composition
EFD = Electric Field
EPI = Energetic Particles and Ion Composition (EPIC)
HEP = High-Energy Particles (LZ only)
LEP = Low-Energy Particles
MGF = Magnetic Field
PWI = Plasma Wave Instrument
QAF = Quality File
SCR = Spacecraft Housekeeping
SPHA = Spin Phase

GOES:

EP8 = Low-Energy Particle and Electrons (Different Energies from EPS)
EPS = Low-Energy Particle and Electrons (E1 and P1 Channel)
MAG = Magnetometer

IMP-8:

MAG = Magnetic Field Investigation
MCE = Multi-Coordinate Ephemeris
PLA = Plasma Investigation

Interball-Tail:

DEF = Definitive Data
ELE = Thermal Electron Experiment
EPI = Energetic Particle Experiment
ICD = Ion Composition
MFI = Magnetic Fields Instrument
PCI = PC Geomagnetic Index

LANL:

MPA = Magnetospheric Plasma Analyzer
SPA = Synchronous Orbit Particle Analyzer

POLAR:

CAM = Charge and Mass Magnetospheric Ion Composition Experiment (CAMMICE)
CEP = Comprehensive Energetic Particle Pitch Angle Distribution (CEPPAD)
EFI = Electric Fields Investigation
HYD = Fast Plasma Analyzer (HYDRA)
MFE = Magnetic Fields Experiment
PDC = VIS Pixel Distortion Correction File
PIX = Polar Ionospheric X-Ray Imaging Experiment (PIXIE)
PWI = Plasma Wave Instrument
QAF = Quality File
SCR = Spacecraft Housekeeping
SEPS = Source/Loss-Cone Energetic Particle Spectrometer

SPHA = Spin Phase
TID = Thermal Ion Dynamics Experiment (TIDE)
TIM = Torodial Imaging Mass Angle Spectrograph (TIMAS)
UVI = Ultraviolet Imager
VIS = Visible Imaging System
VLT = VIS Lookup Table

SAMPEX:

30F = 30 Second Fluxes
POF = Polar Cap Fluxes

SESAME:

AIS = Advanced Ionospheric Sounder
FPI = Fabry-Perot Interferometer
MAG = Fluxgate Magnetometer
RIO = Riometer
VLF = VLF/ELF Logger Experiment (VELOX)

SL:

210 = 210 Magnetic Network

SOHO:

CDS = Coronal Diagnostic Spectrometer
CEL = Charge, Element, and Isotope Analysis System (CELIAS)
CEP = COSTEP-ERNE Particle Analysis Collaboration (CEPAC)
CST = Comprehensive Suprathermal and Energetic Particle analyzer (COSTEP)
EIT = Extreme-Ultraviolet Imaging Telescope
ERN = Energetic and Relativistic Nuclei and Electron experiment (ERNE)
FTR = Full-time resolution attitude data
G001 = SVM HK1 packets
G002 = SVM HK2 packets
G003 = SVM HK3 packets
G004 = SVM HK4 packets
G005 = AOCS HK1 packets
G006 = AOCS HK2 packets
G007 = ATTITUDE 1 packets
G008 = ATTITUDE 2 packets
G009 = S/W packets
G010 = OBT packets
G011 = Experiment HK packets
G012 = CDS HK packets
G013 = CELIAS HK packets
G014 = CEPAC HK packets
G015 = EIT/LASCO HK1 packets
G016 = EIT/LASCO HK2 packets
G017 = EIT/LASCO HK3 packets
G018 = GOLF HK packets
G020 = Reserved EGSE packets
G022 = SUMER HK packets
G023 = SWA HK packets

G024 = UVC HK packets
G025 = VIRGO HK packets
G026 = CDS science LR packets
G027 = CDS science MR packets
G028 = CDS science HR packets
G029 = CEL science packets
G030 = CEP science packets
G031 = EIT/LASCO science LR packets
G032 = EIT/LASCO science HR packets
G033 = GOL science packets
G034 = MDI science packets
G035 = SUMER science LR packets
G036 = SUMER science HR packets
G037 = SWA science packets
G038 = UVC science packets
G039 = VIRGO science packets
G041 = MDI HK packets
GOL = Global Oscillations at Low Frequencies (GOLF)
LAS = Large-Angle Spectrometric Coronograph (LASCO)
MDI = Michelson Doppler Imager
SDR = SOHO Daily Report
SUM = Solar Ultraviolet Measurements of Emitted Radiation (SUMER)
SWA = Solar Wind Anisotropies
TCF = Time Correlation File
UVC = Ultraviolet Coronal Spectrometer
VIR = Variability of Solar Irradiance Gravity Oscillations (VIRGO)

Sondrestromfjord:

GISR = Greenland Incoherent Scatter Radar

WIND:

3DP = 3-D Plasma Analyzer (3DPA)
EPA = Energetic Particle Acceleration Composition Transport (EPACT)
KON = Konus
MFI = Magnetic Fields Investigation
QAF = Quality File
SCR = Spacecraft Housekeeping
SMS = Solar Wind Suprathermal Ion Composition Studies (SWICS/MASS/STICS) (SMS)
SPHA = Spin Phase
SWE = Solar Wind Experiment
TGR = Transient Gamma-Ray Spectrometer (TGRS)
WAV = Radio and Plasma Wave Instrument (WAVES)
WIFP = WIND Fields and Particle Parameters

Date:

YYYYMMDD, where:
YYYY = 4-digit year
MM = month (01–12)
DD = day of month (01–31)

Version:

Vnn	= version of file (01–99)

The valid file extension values are as follows:

SFDU	= an SFDU file
DAT	= generic data file
Sxx	= Data file segment, where xx = 01–99
CDF	= CDF file

2.7 Common Data Format

Note: Section 2.7 is essentially a reprint of the NSSDC's CDF primer. Those familiar with the NSSDC's CDF may omit reading this section. The CDF provides a standard format for describing, storing, and randomly accessing data. The CDF contains two major components: the actual data and the attributes which describe the data. The CDF also provides a standard software package called a CDF library that allows the user to create and access the data and the descriptive attributes. CDF organizes data, which may be of assorted types (such as integer, real), into multidimensional arrays.

2.7.1 CDF Data

The first CDF component is the data, organized into arrays of variables such as time, temperature, and pressure.

Table 2–4 shows a possible CDF array of data in a "flat" representation.

CDF can store scalar data in a "flat" representation like this, but storage in this manner may hide fundamental representations among the data values. Consistent representations found in the data of this example suggest another way to represent the data. Note that records 2 and 6 are observations of the same point on earth for two different times. Note also that only two differing values are recorded for longitude and, similarly, only two differing values are recorded for latitude. The repetition allows the use of a two-dimensional grid structure; for each of the two longitude values there are two latitude values. The grid formed by the longitude and data can be filled with the temperature data.

Time repeats for each longitude/latitude pair; the observations were taken simultaneously across the grid. Because of time's repetition for the longitude/latitude pairs, the number of time values can specify the number of records needed for the two-dimensional grid structure. Thus, the number of records can be decreased to three. Each record contains a two-dimensional grid, as shown in Table 2–5. The grid structure defines the dimension of the CDF. Although there are four variables, only longitude and latitude delimit the grid. Temperature fills the grid while time determines the number of records. The number of discrete values for a dimension (variable) determines the size of that dimension. For example, since longitude has two unique values, it has a dimension of size two.

Another variable, such as pressure level, could be added to this example without difficulty. Temperature would then be a factor of a specific longitude, latitude, and pressure level: a three-dimensional grid structure. In this example, the longitude, latitude, and pressure variables define the number of dimensions of the CDF, while the size of each dimension is determined by the number of discrete values for its respective variable. The number of dimensions of a CDF is called its rank. In Table 2–4, the sample data were represented in a zero-dimensional CDF rather than the more natural two-dimensional CDF shown in Table 2–5.

The CDF dimensions and their corresponding sizes define the CDF array structure. All variables that are created for a given CDF must conform to these dimensions. When creating variables, the term "record variance" indicates whether a variable repeats its values for each record in the CDF, where a record is a user-defined collection of data. In the two-dimensional CDF example above, a record would contain values for the time, longitude, and latitude variables, as well as a two-dimensional grid of temperature values. Time is record variant, since time changes from record to record. Latitude and longitude repeat their values in each record, so they are not record variant. The temperature value grids are record variant, as expected. Table 2–6 presents a summary of the variances of the four variables: time, longitude, latitude, and temperature. Indicating whether a variable is repetitive with respect to the CDF record (i.e., record variant) reduces the amount of physical storage needed for that variable.

Table 2–4. Example CDF—"Flat" Representation

Record Number	Time	Longitude	Latitude	Temperature
1	0100	–150	+30	20.0
2	0100	–150	+40	19.5
3	0100	–165	+30	19.6
4	0130	–165	+40	19.0
5	0130	–150	+30	20.3
6	0130	–150	+40	19.4
7	0130	–165	+30	19.5
8	0130	–165	+40	19.7
9	0200	–150	+30	20.1
10	0200	–150	+40	19.8
11	0200	–165	+30	19.9
12	0200	–165	+40	19.2

Similarly, the term "dimension variance" indicates whether a variable changes with respect to one or more CDF dimensions. In the two-dimensional CDF example shown in Table 2–5, the longitude defines the first dimension of the CDF. Its dimension variance is [f.T]. Because the temperature values were recorded at given longitude and latitude values, their dimension variance is true for both the first and second CDF dimensions, i.e., [T,T]. Time is independent, not depending on either longitude or latitude for its values. Therefore the dimension variance for time is [f,f].

Table 2–5. Example CDF—Two-Dimensional Representation

<table>
<tr><th>Record Number</th><th>Time</th><th>Longitude</th><th>Latitude</th><th>Temperature</th></tr>
<tr><td>1</td><td>0100 – 0100
| |
0100 – 0100</td><td>–165 – –150
| |
–165 – –150</td><td>+40 – +40
| |
+30 – +30</td><td>19.0 – 19.5
| |
19.6 – 20.0</td></tr>
<tr><td>2</td><td>0130 – 0130
| |
0130 – 0130</td><td>-165 – –150
| |
–165 – –150</td><td>+40 – +40
| |
+30 – +30</td><td>19.7 – 19.4
| |
19.5 – 20.3</td></tr>
<tr><td>3</td><td>0200 – 0200
| |
0200 – 0200</td><td>–165 – –150
| |
–165 – –150</td><td>+40 – +40
| |
+30 – +30</td><td>19.2 – 19.8
| |
19.9 – 20.1</td></tr>
</table>

Table 2–6. Example CDF—Specification for Two-Dimensional Representation

Variance	Time	Longitude	Latitude	Temperature
Record	**TRUE**	false	false	**TRUE**
First Dimension	false	**TRUE**	false	**TRUE**
Second Dimension	false	false	**TRUE**	**TRUE**

2.7.2 CDF Attributes

The second component of a CDF is the attribute information. Attributes are used to store data descriptions and can be divided into categories: attributes of global scope and attributes of variable scope. Global attributes describe the CDF as a whole, while variable attributes describe some property of each variable in the CDF. Any number of attributes may be stored in a single CDF.

Global attributes can include any information regarding the CDF and all its variables collectively. Such descriptions could include a title for the CDF, data-set documentation, or a CDF modification history. Table 2–7 exhibits standard CDF attributes used by the NSSDC. Global attributes may contain multiple entries. An example of this would be a CDF modification history kept in the optional global history attribute, MODS. The attribute might be specified at CDF creation time and an entry made with regard to creation date. Any subsequent changes made to the CDF, including additional variables, changes in maximum or minimum values, or recreation of the CDF variables, could be documented by adding entries to the CDF modification history attribute. Additional and significant facts regarding the data in the CDF should be documented within the relevant attribute for CDF completeness.

Variable attributes further describe the individual variables and their values. Examples of variable attributes may include such things as variable field name, the valid minima and maxima, the units used to define the variable data, the format in which the data are stored, a fill value for errant or missing data, and a description of the expected data order (increasing or decreasing). Attributes for one of the Table 2–5 variables is shown in Table 2–8.

2.7.3 CDF Software Library

The CDF software library allows a user to create CDFs and access data randomly using the fundamental concepts described previously without knowledge of low-level format details. Three categories of software functions are used to manipulate the components that make up a CDF: general CDF functions, variable CDF functions, and attribute CDF functions.

Table 2–7. Standard NSSDC CDF Attributes

Required/ Optional	Scope	Attribute Name	Data_Type	Number of Elements
Required	Global	TITLE	Character(CDF_CHAR)	50
	Variable	FIELDNAM	Character(CDF_CHAR)	20
		VALIDMIN	Character(CDF_CHAR)	20
		VALIDMAX	Character(CDF_CHAR)	20
		SCALEMIN	Character(CDF_CHAR)	20
		SCALEMAX	Character(CDF_CHAR)	20
		UNITS	Character(CDF_CHAR)	20
		FORMAT	Character(CDF_CHAR)	8
		MONOTON	Character(CDF_CHAR)	8
Optional	Global	TEXT	Character(CDF_CHAR)	80
		MODS	Character(CDF_CHAR)	80
	Variable	CATDESC	Character(CDF_CHAR)	40
		FILLVAL	Character(CDF_CHAR)	

The general CDF functions are as follows:

CDFcreate()
CDFopen()
CDFdoc()
CDFinquire()
CDFclose()
CDFdelete()
CDFerror()

The general CDF functions allow the user to create a new CDF, open an existing CDF, inquire about a CDF's structure and size, close a CDF, delete an existing CDF, and request error message text. Through the CDFcreate function, the user specifies the number of dimensions the CDF is to have and the size of each dimension. Two additional parameters within the CDFcreate function are "encoding" and "majority." The encoding parameter marks the CDF as either being resident only

Table 2–8. Time Variable Attributes

Attribute	Value
FIELDNAM	TIME
VALIDMIN	0000
VALIDMAX	2359
SCALEMIN	0100
SCALEMAX	0200
UNITS	hours/minutes
FORMAT	I4
MONOTON	increase
FILLVAL	-1

on the host processor or being transportable to other processors. The ordering of variable values in the CDF by either row major or column major order is specified in the majority parameter.

The variable CDF functions are as follows:

CDFvarCreate()
CDFvarNum()
CDFvarRename()
CDFvarInquire()
CDFvarPut()
CDFvarGet()
CDFvarHyperPut()
CDFvarHyperGet()

The variable functions allow the user to create a new variable, determine a variable's identification number, rename a variable, inquire about the characteristics of a variable (datatype, variances), put a variable data value into the CDF, and get a variable data value from the CDF. Variable data are inserted or retrieved from the CDF by referencing the appropriate variable, its dimension indices, and the record number. Furthermore, access calls are provided to allow for insertion of or retrieval of all the data elements for a specified variable record grid or subgrid.

The CDF attribute functions are as follows:

CDFattrCreate()
CDFattrNum()
CDFattrInquire()
CDFattrEntryInquire()
CDFattrPut()
CDFattrGet()

The attribute functions allow the user to create a new attribute, determine an attribute's access number, rename an attribute, inquire about a specific attribute or attribute entry, put values in an attribute and get values from an attribute. When creating an attribute, the user specifies whether the attribute describes a particular CDF variable or describes the CDF globally.

2.7.4 CDF Tools

Several tools have been devised to aid in creating and using CDFs. The skeleton table enables a scientist to specify the structure of a CDF without programming and allows the user to create a skeleton CDF having no variable data. A CDF with all its metadata can be created by writing a text definition file, not a program, and then running a utility (CDFskeleton) that creates a CDF from the text definition. The only source code required to complete a skeleton CDF is that necessary for reading input data and writing variable values to the CDF. Table 2–9 shows the text definition file that would be created for the dataset in the previous example. This skeleton table file could then be used to create the skeleton CDF. A skeleton CDF is defined as any CDF whose definition is complete, but that does not yet contain values for all of its variables. A CDF has a complete definition when

- Its dimensionality and dimension sizes are set.
- All its variables are defined.
- All its attributes are defined.
- All its attributes have been assigned values.

For this example, the dimensionality is two and the sizes have been defined as two in each dimension. The four variables have been named. The global and variable attributes have been named and the attributes contain legal values. The record variance and dimension variance for each variable also have been defined. The utility CDFskeleton can now accept this text file (Table 2–9) and create a completely formatted skeleton CDF (i.e., a CDF outline without data). The skeleton CDF can then be passed on to a programmer to write the necessary code to load data into the CDF variables. The tool CDFinquire can be used to list the header, attribute definitions and values, and variable definitions for the CDF. This includes the CDF dimension, the number of attributes, the number of variables, the majority, the record variance and the dimension variances for the variables; all those details provided by the scientist in the skeleton table text file. From this information, a programmer can ascertain how the variable data should be entered into the CDF. Once the data are in the CDF variables, the tool CDFbrowse can be used to display the variable values. CDFbrowse is a good tool to use for verifying that data have been correctly loaded into the CDF.

The CDFlist tool can be used to become acquainted with an existing CDF. CDFlist is designed to read user specified portions of a CDF. A user may specify a range on any variable in the CDF. For example, using the previous two-dimensional CDF, a user may wish to see data for a particular time or data at only one of the two specified longitudes or latitudes. CDFlist allows the user to create a subset CDF using only the values specified in a selected range, as long as the range is specified for a variable which defines a CDF (i.e., time defines the number of records in the example CDF; longitude defines one dimension; and latitude defines another dimension). Selecting a range on a variable that has both record and dimension variance (i.e., temperature in the example CDF, is allowed but for output to a screen or file only, not for generating output to a CDF).

2.7.5 Sample CDF Skeleton

The KPGS Programmer’s Guide (Reference 6) contains an up-to-date sample key parameter CDF skeleton.

Table 2–9. Key Parameters Standards and Conventions

• Key parameter resolution is on the order of 1 minute (actually, many key parameters are time tagged using multiples of half the major frame rate of the spacecraft). Major frame rates are GEOTAIL, 16 seconds; WIND, 92 or 46 seconds; POLAR, 9.2 seconds; IMP-8, 1.28 seconds and is generally time tagged to the middle of the measurement.
• Key parameter tag is presented in two separate representations in each key parameter record:
– ISTP Standard Time (Time_PB5)—An intuitive representation (year, day, and elapsed millisecond (ms) of day).
– NSSDC Standard Time (Epoch)—A representation easy to use in computing and display, elapsed ms since AD.
• Missing or bad key parameters are represented with standard "fill" values.
• Coordinate systems for key parameters are left to the discretion of the PI teams. Geocentric Solar Eliptic (GSE) and Geocentric Solar Magnetospheric (GSM) are common systems used by many of the key parameters.
• Externally generated key parameters always have spacecraft position and attitude embedded in each key parameter record, if appropriate. Again, the particular coordinate system is left to the discretion of the PI team.
• Each key parameter record contains quality information; also, the CDHF catalog stores quality information for each individual key parameter dataset.
• Each key parameter record contains a post-gap flag that explains, if appropriate, the reason a gap in data coverage occurred.
• General key parameter datasets span 1 day.
• All key parameter datasets (both external and internal) are presented as CDFs with detached ISTP SFDUs.
• Key parameter software is written in FORTRAN and/or C.

2.8 ISTP Key Parameters

Note: This section was extracted from Reference 3.

It was recognized early that to accomplish ISTP scientific goals, the ability would be needed to quickly survey, in a coordinated and on-going fashion, the vast array of scientific data being gathered by the instrumentation. Such a timely survey should reveal scientifically interesting phenomena (events) almost immediately and should be of great value during the scientific campaigns. Thus, the concept of key parameters was born. In general, key parameters are low-resolution time series (on the order of 1 minute[1]) computed from each instrument. Key parameters computed internally to the CDHF are based on level-zero (decommutated telemetry) or SIRIUS data (full GEOTAIL telemetry stream) as input. Key parameters also are generated externally to the CDHF that are ingested from a variety of ground-based instruments and non-ISTP spacecraft. In general, each key parameter dataset covers 1 complete day[2]. Internally generated key parameters

[1] Actually, many spacecraft key parameters are time tagged using multiples of half the major frame rate of the spacecraft. Major frame rates are GEOTAIL, 16 seconds; WIND, 92 or 46 seconds; POLAR, 9.2 seconds; IMP-8, 1.28 seconds.

[2] Exceptions are key parameter datasets from IMP-8 which span approximately 1-week periods and key parameter sets from some of the ground-based investigations.

are generally available within a few days of real time. The delay from real time for externally generated key parameters can range from near-real time to several weeks, depending on their source. Appendix A summarizes the set of key parameters understood as of this writing. The residency time for key parameter datasets on the CDHF storage is at least 90 days with CD-ROM containing the most recent 90 days of key parameters being generated by the DDF for distribution to the ISTP scientific community every 90 days. For rapid access, key parameters residing on the CDHF are also accessible via standard computer networks (both DECnet protocols and TCP/IP are supported) approximately 1 hour after generation or ingestion into the CDHF.

Software for internally generated key parameter production is provided by the PI team for each instrument and is integrated into the CDHF production environment prior to the launch (in most cases) of each spacecraft (GEOTAIL, WIND, POLAR, SOHO, and IMP-8). The first 6 months after instrument activation[3] is a period of time set aside to allow these PI teams to come to a better understanding of the on-orbit operation of their instrumentation and thus refine the key parameter software appropriately. Because it is anticipated that additional refinement of the key parameter software will take place over the life of the ISTP mission, the CDHF environment has been designed to allow for rapid update of key parameter software and the ability to handle multiple versions of the same key parameter dataset, which can exist because of reprocessing.

Quality information is available for each key parameter dataset in the CDHF catalog and is embedded in the key parameter data records as a data element. All key parameter datasets are presented as CDF files. Both internally and externally generated key parameter datasets adhere to mutually agreed on standards and conventions to permit rapid analysis and comparisons of the more than 100 key parameter datasets from a variety of instrumentation. The more important of these standards and conventions are listed in Table 2–9.

[3] For example, GEOTAIL was launched July 1992, but all of the instrumentation was not activated until September 1992.

SECTION 3—ISTP DATA FILE FORMATS

This section describes the detailed formats of the data files provided to the investigators by either the CDHF or the DDF. A detached ISTP SFDU header is associated with each of these files. The data files are as follows:

- Level-zero data files
- SIRIUS formatted data files for GEOTAIL
- Q/A files
- Housekeeping data file
- Command history file
- Key parameter files
- Definitive and predictive orbit data files
- Definitive and predictive attitude data files

3.1 Level-Zero Data Format

A level-zero data file contains the level-zero and instrument housekeeping data for one instrument for a given day. Level-zero data is created and provided for all WIND and POLAR instruments and applicable GEOTAIL instruments.

Figure 3–1 shows the format of the level-zero data file. Each instrument level-zero data file contains a file label record (FLR) and a variable number of data records, each containing a data record header (DRH), followed by one major frame's worth of telemetry samples. Physical record size is fixed within a given instrument file but varies across instruments, depending on the number of instrument sample words in a telemetry major frame. The minimum physical record size is 2792 bytes, the minimum size of an FLR. The maximum physical record size is 32 kilobytes (kB).

The actual record size for a specific instrument file is determined by the number of bytes generated by the instrument in a telemetry major frame plus the DRH. If this value is less than the minimum FLR size (2792 bytes), the physical record size is fixed at 2792 bytes, and the data records are zero-filled out to this length. If the major frame bytes plus the DRH size is within the 2792 byte-to-32-kB range, then the remaining unused part of the FLR is blank-filled to this size. If the major frame bytes plus DRH size is greater than 32 kB, the logical record must be subdivided into multiple physical records that conform to the 2792 byte-to-32-kB rule. Note that none of the instruments onboard the GEOTAIL, WIND, or POLAR spacecraft generate so much telemetry data that such subdivision of the logical records is necessary.

The number of data records varies with the period covered by the data and the quality of the transmission. A production level-zero file spans a 24-hour, midnight-to-midnight Greenwich mean time (GMT) period. A quicklook level-zero file spans the first hour's worth of telemetry received during a GEOTAIL contact.

Note that level-zero files for a instrument do not overlap. The first data record in a file contains the data from the first major frame that began after midnight GMT; the last data record in the file contains the data from the last major frame that began before midnight GMT. Thus, every record in the file contains data for major frames that begin on the same day.

This section presents the formats of the level-zero data file FLR, DRH, and records for each of the GEOTAIL, WIND, and POLAR instruments.

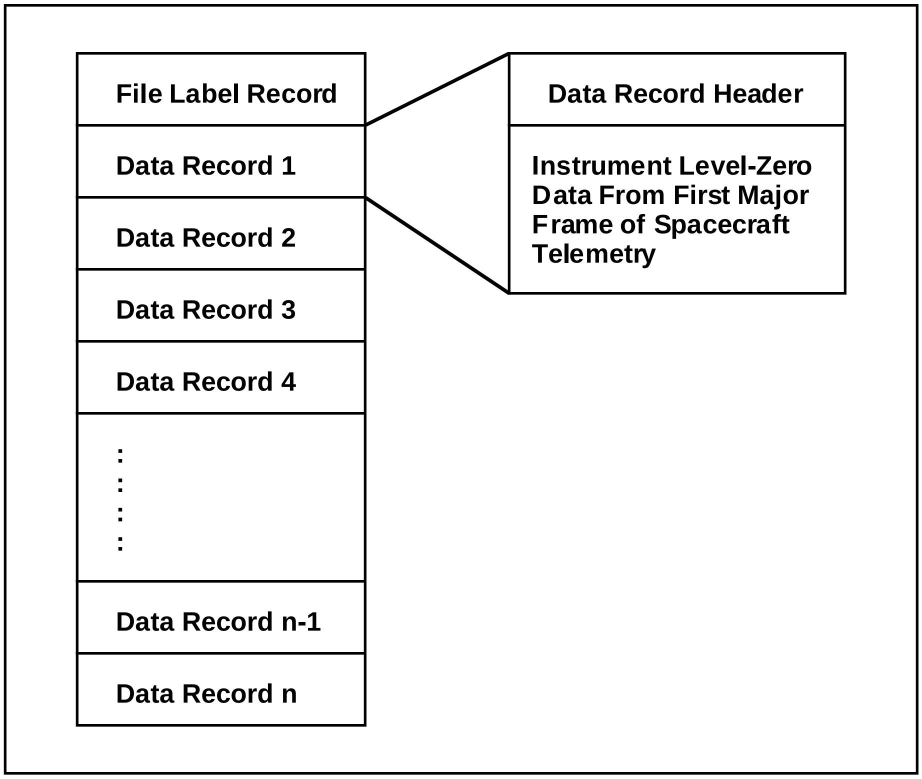


Figure 3–1. Level–Zero Data File Format

3.1.1 Level-Zero Data File Label Record

An FLR is the first instrument level-zero file record following the ISTP data header. The FLR information occupies 2792 bytes. If the instrument data record (DRH plus the instrument data for a major frame) size exceeds 2792 bytes, zeros (null) are used to fill the FLR out to the size of the data record.

3.1.1.1 Level-Zero Data File Label Record Definition

Table 3–1 defines each field in the level-zero data file label record.

Table 3–1. Level-Zero Data File Label Record Definition (1 of 3)

Field	Bytes	Field Name	Comments
1	0–3	Spacecraft ID	(‘GEOTAIL’/‘WIND’/ ‘POLAR’)
2	4–7	Instrument Number	
3	8–11	Instrument Name	

Table 3–1. Level-Zero Data File Label Record Definition (2 of 3)

Field	Bytes	Field Name	Comments
4	12–15	Physical Record Count	(1) (first record)
5	16–19	Physical Records Per Major Frame	(1)
6	20–23	Number of Physical Records in File	
7	24–27	Major Frame Count—Beginning of First Major Frame	
8	28–31	Major Frame Count—Beginning of Last Major Frame	
9	32–39	Spacecraft Clock—Beginning of First Major Frame	
10	40–47	Spacecraft Clock—Beginning of Last Major Frame	
11	48–51	ATC:year—Beginning of First Major Frame	
12	52–55	ATC:day—Beginning of First Major Frame	
13	56–59	ATC:msec—Beginning of First Major Frame	
14	60–63	ATC:µsec—Beginning of First Major Frame	WIND/POLAR only
15	64–67	ATC:year—Beginning of Last Major Frame	
16	68–71	ATC:day—Beginning of Last Major Frame	
17	72–75	ATC:msec—Beginning of Last Major Frame	
18	76–79	ATC:µsec—Beginning of Last Major Frame	WIND/POLAR only
19	80–83	Number of Major Frames Expected	
20	84–87	Number of Major Frames in File	
21	88–91	Major Frame Level Gaps in Coverage	
22	92–95	Data Coverage Type	(‘PROD’ or ‘QL’)
23	96–99	Decommutation Rerun Number	
24	100–107	Decommutation Program Version Number	
25	108–115	Decommutation Characteristics Database Version Number	
26	116–131	Decommutation Run Date/Time	
27	132–175	Instrument Filename	
28	176–179	Physical Record Length	
29	180–199	Spares	
30	200–203	Merge Rerun Number	
31	204–211	Merge Program Version Number	

Table 3–1. Level-Zero Data File Label Record Definition (3 of 3)

Field	Bytes	Field Name	Comments
32	212–227	Merge Run Date/Time	
33	228–231	Number of Edit Files	(1–20)
34	232–275	Edit File 1-Edit Filename	
35	276–299	Edit File 1-Edit Key	
36	300–303	Edit File 1-Edit Rerun Number	
37	304–311	Edit File 1-Edit Program Version Number	
38	312–327	Edit File 1-Edit Run Date/Time	
39	328–331	Edit File 1-Data Type	(‘R/T’ or ‘P/B’)
40	332–359	Edit File 1-Message Key	
41	360–403	Edit File 2-Edit Filename Same	
–	. .	. .	
166	2636–2663	Edit File 19-Message Key	
167	2664–2707	Edit File 20-Edit Filename	
168	2708–2731	Edit File 20-Edit Key	
169	2732–2735	Edit File 20-Edit Rerun Number	
170	2736–2743	Edit File 20-Edit Program Version Number	
171	2744–2759	Edit File 20-Run Date/Time	
172	2760–2763	Edit File 20-Data Type	(‘R/T’ or ‘P/B’)
173	2764–2791	Edit File 20-Message key	
174	2792–EOR	Fill Bytes (if data record size exceeds 2792 bytes)	

3.1.1.2 Level-Zero Data File Label Record Field Descriptions

The following describes each FLR field:

Field Name:	**Spacecraft ID**
Type/Length:	Integer/4
Values:	24 = GEOTAIL
	25 = WIND
	26 = POLAR
Description:	Identifies the spacecraft that transmitted the data contained in this instrument or housekeeping file.

Field Name:	**Instrument Number**	
Type/Length:	Integer/4	
Values:	GEOTAIL	01 = ‘PWI’
		02 = ‘HEP’
		03 = ‘MGF’
		04 = ‘LEP’
		05 = ‘EFD’
		06 = ‘EPI’
		07 = ‘CPI’
		08 = ‘SCR’
		99 = ‘QAF’
	WIND	01 = ‘WAV’
		02 = ‘EPA’
		03 = ‘MFI’
		04 = ‘SWE’
		05 = ‘SMS’
		06 = ‘3DP’
		07 = ‘TGR’
		08 = ‘KON’
		09 = ‘SCR’
		99 = ‘QAF’
	POLAR	01 = ‘PWI’
		02 = ‘HYD’
		03 = ‘MFE’
		04 = ‘TIM’
		05 = ‘TID’
		06 = ‘UVI’
		07 = ‘VIS’
		08 = ‘PIX’
		09 = ‘CAM’
		10 = ‘CEP’
		11 = ‘EFI’
		12 = ‘SCR’
		99 = ‘QAF’
Description:	The two-digit identification code that identifies which instrument’s data is contained in this instrument, spacecraft housekeeping, or quality and accounting file.	

Field Name:	**Instrument Name**
Type/Length:	Character/4
Values:	The values shown for the instrument numbers above correlate the numbers to the instrument names.
Description:	The three-character code that identifies which instrument's data is contained in this instrument or housekeeping file.

Field Name:	**Physical Record Count**
Type/Length:	Integer/4
Value:	1
Description:	The relative position of this physical record within the instrument or housekeeping file (i.e., the FLR is the first record in the file).

Field Name:	**Physical Records per Major Frame**
Type/Length:	Integer/4
Value:	1
Description:	The number of physical data records in a major frame.

Field Name:	**Maximum Number of Physical Records in File**
Type/Length:	Integer/4
Values:	GEOTAIL: D-2701 WIND: 1879* POLAR: 9392
Description:	The maximum number of data records in an instrument or housekeeping file (i.e., number of major frames/day plus 1 for FLR). *Note: The normal maximum number of records (major frames) for the WIND spacecraft is about 940 (86,400 seconds/ day, 92 seconds per major frame) with a data rate of 5.56 kbps. Inside 60 Earth radii (Re), the possible data rate is 11.1 kbps. Refer to Reference 9 (WIND-POLAR SIRD) for additional information.

Field Name:	**Major Frame Count—Beginning of 1st Major Frame**
Type/Length:	Integer/4
Description:	The major frame counter value at the beginning of the first major frame (3 bits for GEOTAIL and 8 bits for WIND/POLAR). Note: The value for GEOTAIL is taken from the high-order 3 bits of the subcommutated minor frame clock value in the telemetry frame. All the subsequent beginning-of-major-frame values are from the spacecraft value in the major frame.

Field Name: **Major Frame Count—Beginning of Last Major Frame**

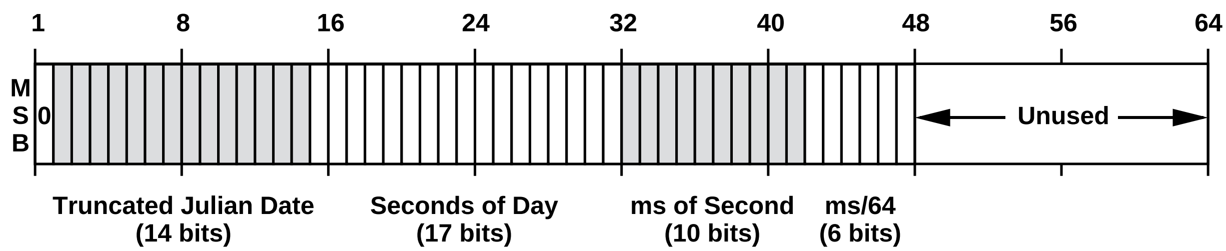
Type/Length: Integer/4

Description: The major frame counter value at the beginning of the last major frame (3 bits for GEOTAIL and 8 bits for WIND/POLAR). See GEOTAIL note for beginning of major frame.

Field Name: **Spacecraft Clock—Beginning of 1st Major Frame**

Type/Length: Integer/8

Description: The spacecraft clock reading at the beginning of the first major frame (32-bit time count for GEOTAIL and 48-bit PB5 time code for WIND/POLAR). This value is retrieved from the telemetry frame. The following example shows a breakdown of the 48-bit PB5 time code format (see References 8 and 9 for additional detail):



GGS PB5 Time Code Format

MSB – Most significant bit
ms – Milliseconds
ms/64 – 1/64th of millisecond

Field Name: **Spacecraft Clock—Beginning of Last Major Frame**

Type/Length: Integer/8

Description: The spacecraft clock reading at the beginning of the last major frame (32-bit time count for GEOTAIL and 48-bit PB5 time code for WIND/POLAR). See 48-bit PB5 time code breakdown above.

Field Name: **ATC: Year—Beginning of 1st Major Frame**

Type/Length: Integer/4

Description: The ATC year at the beginning of the first major frame.

Field Name: **ATC: Day—Beginning of 1st Major Frame**

Type/Length: Integer/4

Description: The ATC day of year at the beginning of the first major frame.

Field Name: **ATC: Msec—Beginning of 1st Major Frame**
Type/Length: Integer/4
Description: The ATC millisecond of day at the beginning of the first major frame.

Field Name: **ATC: µsec—Beginning of 1st Major Frame**
Type/Length: Integer/4
Description: The ATC microseconds at the beginning of the first major frame. (Note that microsecond of day = 1000 * msec + µsec.) This field is for WIND/POLAR only.

Field Name: **ATC: Year—Beginning of Last Major Frame**
Type/Length: Integer/4
Description: The ATC year at the beginning of the last major frame.

Field Name: **ATC: Day—Beginning of Last Major Frame**
Type/Length: Integer/4
Description: The ATC day of year at the beginning of the last major frame.

Field Name: **ATC: Msec—Beginning of Last Major Frame**
Type/Length: Integer/4
Description: The ATC millisecond of day at the beginning of the last major frame.

Field Name: **ATC: µsec—Beginning of Last Major Frame**
Type/Length: Integer/4
Description: The ATC thousandths of millisecond (i.e., microseconds) at the beginning of the last major frame. (Note that microsecond of day = 1000 * msec + µsec.) This field is for WIND/POLAR only.

Field Name: **Number of Major Frames Expected**
Type/Length: Integer/4
Description: The number of major frames expected in a 24-hour period.

Field Name: **Number of Major Frames in File**
Type/Length: Integer/4
Description: The actual number of major frames in this instrument or housekeeping file.

Field Name: **Major Frame Level Gaps in Coverage**
Type/Length: Integer/4
Description: The number of data gaps (each of which involves one or more missing major frames).

Field Name: **Data Coverage Type**
Type/Length: Character/4
Value(s): 'PROD' or 'QL'
Description: The type of data coverage either production or quicklook.

Field Name: **Decommutation Rerun Number**
Type/Length: Integer/4
Description: The sequence number associated with the decommutation request. Specifies the EDS software rerun number that produced this instrument file; EDS may be run a number of times on the same input data.

Field Name: **Decommutation Program Version Number**
Type/Length: Character/8
Description: The version number of the decommutation program used to create this instrument or housekeeping file.

Field Name: **Decommutation Characteristics Database Version Number**
Type/Length: Character/8
Description: The version number of the decommutation characteristics file used to create this instrument or housekeeping file.

Field Name: **Decommutation Run Date/Time**
Type/Length: Character/16
Description: The local computer time (GMT) that this instrument or housekeeping file was created. The format is YYYYDDDHHMMSSUUU, where

YYYY = four-digit year identifier
DDD = three-digit day of year
HH = two-digit hour of day
MM = two-digit minute of hour
SS = two-digit second of minute
UUU = three-digit millisecond of second

Field Name: **Instrument Filename**
Type/Length: Character/44
Description: The name associated with the instrument or housekeeping file created by the decommutation function.

Field Name: **Physical Record Length**
Type/Length: Integer/4
Description: Number of bytes in a physical record. This value is equal to the number of bytes per minor frame allocated to an instrument multiplied by the number of minor frames per major frame plus the length in bytes of the data record header. Note that the minimum physical record length is 2792 bytes.

Field Name:	**Spares**
Type/Length:	Character/20
Description:	Zero (null)-filled spare bytes.

Field Name:	**Merge Rerun Number**
Type/Length:	Integer/4
Description:	The sequence number associated with the merge request.

Field Name:	**Merge Program Version Number**
Type/Length:	Character/8
Description:	The version number of the merge program used to create this instrument or housekeeping file.

Field Name:	**Merge Run Date/Time**
Type/Length:	Character/16
Description:	The local computer time (GMT) that this merge file was created. The format is YYYYDDDHHMMSSUUU, where YYYY = four-digit year identifier DDD = three-digit day of year HH = two-digit hour of day MM = two-digit minute of hour SS = two-digit second of minute UUU = three-digit millisecond of second

Field Name:	**Number of Edit Files**
Type/Length:	Integer/4
Value(s):	1 through 20 (end points inclusive)
Description:	The maximum number of edit files with major frames that are within the requested timespan for a data group in the merge request.

Field Name:	**Edit File (n)—Edit Filename**
Type/Length:	Character/44
Description:	Name of the nth edit file.

Field Name:	**Edit File (n)—Edit Key**
Type/Length:	Character/24
Description:	The key for the edit file. The format is EDITXXYYYYDDDHHMMSSVV, where EDIT = ‘EDIT’ XX = two-digit satellite code YYYY = four-digit year identifier

DDD = three-digit day of year
HH = two-digit hour of day
MM = two-digit minute of hour
SS = two-digit second of minute
VV = two-digit version number

Field Name: **Edit File (n)—Edit Rerun Number**

Type/Length: Integer/4

Description: The sequence number associated with the edit file for a specific tape recorder dump or real-time pass.

Field Name: **Edit File (n)—Edit Program Version Number**

Type/Length: Character/8

Description: The version number of the edit program used to create this instrument or housekeeping file.

Field Name: **Edit File (n)—Edit Run Date/Time**

Type/Length: Character/16

Description: The local computer time (GMT) that this edit file was created. The format is YYYYDDDHHMMSSUUU, where

YYYY = four-digit year identifier
DDD = three-digit day of year
HH = two-digit hour of day
MM = two-digit minute of hour
SS = two-digit second of minute
UUU = three-digit millisecond of second

Field Name: **Edit File (n)—Data Type**

Type/Length: Character/4

Value(s): ‘P/B’ or ‘R/T’

Description: The source of the edit file data was via playback transmission or real time.

Field Name: **Edit File (n)—Message Key**

Type/Length: Character/28

Description: Key of the input message file in the following format: NSSYYDDHHMMSSVV, where

N = one-character message key constant (“M”)
SS = two-digit spacecraft identification
YY = two-digit year identifier
DDD = three-digit day of year
HH = two-digit hour of day
MM = two-digit minute of hour
SS = two-digit second of minute
VV = two-digit version number

3.1.1.3 FLR Fields Loaded by NRT Subsystem

The Near-Real-Time (NRT) subsystem of the CDHF generates level-zero data files on the CDHF using data it receives in near-real time from the GDCF. The user may retrieve this data via the user interface. The NRT loads the following FLR fields: 1 through 20, 22, 26, 27, and 28.

3.1.2 Level-Zero Data Record Header

Each data record in a level-zero data file begins with a DRH. Note that the minor frame quality field (last field) consists of 1 byte of quality flags for each minor frame. This section defines and describes the DRH.

3.1.2.1 Level-Zero Data Record Header Definition

Table 3–2 defines each field in the DRH of the level-zero data file.

Table 3–2. Data Record Header Definition

Field	Bytes	Field Name	Comments
1	0–3	Instrument Number	
2	4–7	Physical Record Number Within File	
3	8–11	Major Frame Count—Beginning of Major Frame	
4	12–19	Spacecraft Clock—Beginning of Major Frame	
5	20–23	ATC:year—Beginning of Major Frame	
6	24–27	ATC:day—Beginning of Major Frame	
7	28–31	ATC:msec—Beginning of Major Frame	
8	32–35	ATC:µsec—Beginning of Major Frame	WIND/POLAR only
9	36–39	Number of Minor Frames With Fill	
10	40–43	Number of Minor Frames With Frame Sync Error	
11	44–47	Telemetry Mode Indicator	
12	48–559	Minor Frame Quality (GEOTAIL)	
	48–299	Minor Frame Quality (WIND/POLAR)	

3.1.2.2 Level-Zero Record Header Field Descriptions

The following information describes each DRH field:

Field Name:	**Instrument Number**
Type/Length:	Integer/4
Value(s):	Refer to instrument numbers in the FLR description.
Description:	The two-digit code that identifies which instrument's data is contained in this instrument or housekeeping file.

Field Name:	**Physical Record Number Within File**
Type/Length:	Integer/4
Value(s):	GEOTAIL: up to 2701 WIND: up to 1879 (Note: Refer to maximum number of physical records in file note in FLR description.) POLAR: up to 9392
Description:	The relative position of this record with the ISTP data header is record 1 in the instrument or housekeeping file where the FLR is record 1, the first data record is record 2, and the nth data record is record n + 1.

Field Name:	**Major Frame Count—Beginning of Major Frame**
Type/Length:	Integer/4
Description:	The major frame counter value at the beginning of the major frame (22 bits for GEOTAIL and 8 bits for WIND/POLAR). See notes in FLR major frame count.

Field Name:	**Spacecraft Clock—Beginning of 1st Major Frame**
Type/Length:	Integer/8
Description:	The spacecraft clock reading at the beginning of the major frame (32-bit time count for GEOTAIL, and 56-bit PB5 time code for WIND/POLAR). See the example in FLR spacecraft clock field for breakdown of the 56-bit PB5 time code.

Field Name:	**ATC: Year—Beginning of Major Frame**
Type/Length:	Integer/4
Description:	The ATC year at the beginning of the major frame.

Field Name:	**ATC: Day—Beginning of Major Frame**
Type/Length:	Integer/4
Description:	The ATC day of year at the beginning of the major frame.

Field Name:	**ATC: Msec—Beginning of Major Frame**
Type/Length:	Integer/4
Description:	The ATC millisecond of day at the beginning of the major frame.

Field Name: **ATC: μsec—Beginning of Major Frame**

Type/Length: Integer/4

Description: The ATC microsecond at the beginning of the major frame. (Note that microsecond of day = 1000 * msec + μsec.) This field is for WIND/POLAR only.

Field Name: **Number of Minor Frames With Fill**

Type/Length: Integer/4

Description: The number of minor frames within this instrument or housekeeping record with zero (null) fill due to a natural data gap, data deletion, or frame counter jumps. (Note that this field relates to the minor frame quality field.)

Field Name: **Number of Minor Frames With Frame Sync Error**

Type/Length: Integer/4

Description: The number of minor frames within this instrument or housekeeping record that have frame sync error. (Note that a frame sync error is when the beginning frame count bits fail to match a prespecified bit pattern. This field relates to the minor frame quality field.)

Field Name: **Telemetry Mode Indicator**

Type/Length: Integer/4

Value(s): For GEOTAIL:

- 1 – Science mode (32 seconds)
- 2 – Engineering mode (32 seconds)
- 3 – Contingency mode (32 seconds)
- 128 – Transitional mode
- 256 – Unknown mode

For WIND and POLAR:

- 1 – Science mode (92 seconds for WIND, 9.2 seconds for POLAR)
- 2 – Not used by WIND or POLAR
- 3 – Maneuver mode (92 seconds for WIND, 9.2 seconds for POLAR)
- 4 – Contingency mode (92 seconds for WIND, 9.2 seconds for POLAR)
- 5 – Science mode (46 seconds, WIND only)
- 6 – Not used by WIND or POLAR
- 7 – Maneuver mode (46 seconds, WIND only)
- 8 – Contingency mode (46 seconds, WIND only)
- 128 – Transitional mode
- 256 – Unknown mode

Description: The data mode of the telemetry major frame containing the data in this record. This information is retrieved from the telemetry frame or determined by the decommutation software.

Field Name:	**Minor Frame Quality**
Type/Length:	Integer/4
Description:	One byte of quality flags for each minor frame. The flags indicate whether the corresponding minor frame has fill, a frame counter error, or a frame/sync error (128 words for GEOTAIL and 63 words for WIND/POLAR). Since 63 words equals 252 bytes and there are only 250 minor frames in a WIND or POLAR major frame, the last 2 bytes in the WIND/POLAR DRH are zero-filled. If a quality byte is zero-filled, no errors were detected in the corresponding minor frame. A bit set to "1" indicates an error. The following diagram identifies the specific error associated with each bit:

7	6	5	4	3	2	1	0

bit 0 = frame sync error flag
bit 1 = frame counters error flag
bit 2 = fill frame flag
bit 3–7 = spares

Thus, if the number "2" bit is set to "1", the corresponding minor frame is filled with zeros because of missing or unreadable data.

3.1.3 Level-Zero Data Subrecord Formats

The data (nonheader) part of each level-zero-processed data record for a given instrument is subdivided into fixed-length subrecords, each containing that instrument's instrument data and instrument housekeeping data from a minor (sub) frame. The length of the subrecord depends on the number of minor frame bytes allocated to the instrument, including subcommutated (sometimes called loose) bytes. Whenever a housekeeping or subcommutated byte is not allocated to the instrument, a zero-filled byte is inserted into the subrecord instead.

The total length of the record in bytes is the number of bytes per subrecord times the number of minor frames per major frame plus the DRH length plus any additional bytes needed to pad the record to the 4-byte word boundary. As indicated in Section 3.1, the minimum data record size is 2792 bytes, which is the minimum size of an FLR. Note that for WIND/POLAR instruments the DRH is 300 bytes long and there are 250 minor frames per major frame. For GEOTAIL the DRH is 560 bytes long and there are 512 minor frames per major frame.

A zero-filled subrecord is put in the output data record when the associated input minor frame is missing or cannot be interpreted. The DRH contains 1 byte of quality flags for each minor frame (subrecord). One quality flag indicates whether the associated subrecord is filled with zeros. Other quality flags denote frame counter and frame synchronization errors. The statistical information in the Q/A file record associated with a major frame also indicates which minor frames (subrecords) are zero-filled.

The ISTP GDPS never outputs an entire major frame of zero fill. Thus, if the entire major frame is missing from the input or is not interpretable, the result will be a time gap in the output. The Q/A file indicates which major frames are missing. A missing major frame also can be determined by comparing the major frame count in the DRH of the previous data record to that of the current data record. The frame count increases monotonically from one record to the next when there is no gap between them.

Each level-zero subrecord is presented as a horizontal table containing subrecord output byte 0 through the last byte in the subrecord. Multiple rows are used as necessary. Immediately below each row of subrecord output bytes is a row depicting the corresponding telemetry minor frame input byte that is the data source for the output byte. For housekeeping and subcommutated bytes, commentary notes are used to indicate which minor frames are allocated to the instrument being depicted. Additional commentary is used when necessary to describe an unusual circumstance.

As applicable, multiple formats are shown for instruments to depict contingency mode and maneuver mode formats.

Note that the information source for the GEOTAIL minor frame formats is Reference 7. The information source for the WIND minor frame formats is Reference 8, and the information source for the POLAR minor frame formats is Reference 9.

The formats of the level-zero data subrecords for each of the instruments onboard the GEOTAIL, WIND, and POLAR spacecraft are presented in the following subsections.

Note: The subsection descriptions use the commonly accepted acronym (e.g., GEOTAIL EPIC) rather than the sometimes shorter logical file identifier descriptor value.

3.1.3.1 GEOTAIL Spacecraft Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data records and subrecord formats for each instrumentonboard the GEOTAIL spacecraft. Formats are provided for two GEOTAIL spacecraft telemetry modes: record observation (usual) and contingency. The telemetry mode is specified in the DRH. Contingency mode is necessitated by a GEOTAIL spacecraft editor failure contingency. Figure 3–2 depicts the high-level telemetry format for the GEOTAIL spacecraft. (Reference 7 provides the detailed telemetry format for GEOTAIL). Note that a major frame contains 512 minor frames (numbers 1–512) of 128 bytes (numbered 0–127) each.

→ Byte / ↓ Minor Frame	0	1	2	3	•	•	127
1							
2							
3							
•							
•							
512							

Figure 3–2. GEOTAIL Telemetry Format for Major Frame

Note that the following sections specify for each instrument onboard the GEOTAIL spacecraft which telemetry bytes of each minor frame are allocated to the instrument. For example, in the record observation mode, the following eight bytes of each minor frame of telemetry are allocated to the EFD instrument: 16, 17, 18, 19, 20, 21, 22, and 23. These sections also relate these telemetry bytes to the level-zero data record for the instrument. Note that the telemetry handbook that defines the telemetry fields for GEOTAIL is a TBS.

3.1.3.1.1 EFD Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data records and subrecord formats for the GEOTAIL EFD instrument.

3.1.3.1.1.1 EFD Instrument Record Observation Data Record and Subrecord Formats

The EFD instrument generates 8 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL record observation mode. The following is the format of the level-zero-processed EFD data record for the GEOTAIL record observation mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing EFD level-zero data from GEOTAIL minor frame 1	8	560–567
3	Subrecord 2 containing EFD level-zero data from GEOTAIL minor frame 2	8	568–575
4–512	Subrecord 3–511 containing EFD level-zero data from GEOTAIL minor frames 3–511	4072	576–4647
513	Subrecord 512 containing EFD level-zero data from GEOTAIL minor frame 512	8	4648–4655
Total record length: 4656 bytes (1164 words)			

The EFD instrument record observation subrecord format consists of an 8-byte logical subrecord for each minor frame in a major frame of telemetry. These 8 bytes correspond to the indicated 8 minor frame bytes of the GEOTAIL spacecraft record observation telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7
Telemetry Minor Frame Byte	16	17	18	19	20	21	22	23

Note that through the remainder of this DFCD, the terms subrecord output byte and telemetry minor frame byte are abbreviated to subrecord output byte and minor frame input byte.

3.1.3.1.1.2 EFD Instrument Contingency Data Record and Subrecord Formats

The EFD instrument generates 15 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL contingency mode. The following is the format of the level-zero-processed EFD data record for the GEOTAIL contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing EFD level-zero data from GEOTAIL minor frame 1	15	560–574
3	Subrecord 2 containing EFD level-zero data from GEOTAIL minor frame 2	15	575–589
4–512	Subrecord 3–511 containing EFD level-zero data from GEOTAIL minor frames 3–511	7635	590–8224
513	Subrecord 512 containing EFD level-zero data from GEOTAIL minor frame 512	15	8225–8239
Total record length: 8240 bytes (2060 words)			

The EFD instrument contingency subrecord format consists of a 15-byte logical subrecord for each minor frame in a major frame of telemetry. These 15 bytes correspond to the indicated 15 minor frame bytes of the GEOTAIL spacecraft contingency telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7
Minor Frame Input Byte	16	17	18	19	66	67	68	69

Subrecord Output Byte	8	9	10	11	12	13	14
Minor Frame Input Byte	70	71	72	73	74	75	76

3.1.3.1.2 MGF Instrument Level-Zero Data Records and Subrecord Formats

This section presents the level-zero data records and subrecord formats for the GEOTAIL MGF instrument.

3.1.3.1.2.1 MGF Instrument Record Observation Data Record and Subrecord Formats

The MGF instrument generates 8 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL record observation mode. The following is the format of the level-zero processed MGF data record for the GEOTAIL record observation mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing MGF level-zero data from GEOTAIL minor frame 1	8	560–567
3	Subrecord 2 containing MGF level-zero data from GEOTAIL minor frame 2	8	568–575

Item	Description	Length (bytes)	Record (bytes)
4–512	Subrecord 3–511 containing MGF level-zero data from GEOTAIL minor frames 3–511	4072	576–4647
513	Subrecord 512 containing MGF level-zero data from GEOTAIL minor frame 512	8	4648–4655
Total record length: 4656 bytes (1164 words)			

The MGF instrument record observation subrecord format consists of an 8-byte logical subrecord for each minor frame in a major frame of telemetry. These 8 bytes correspond to the indicated 8 minor frame bytes of the GEOTAIL spacecraft record observation telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7
Minor Frame Input Byte	24	25	26	27	28	29	30	31

3.1.3.1.2.2 MGF Instrument Contingency Data Record and Subrecord Formats

The MGF instrument generates 12 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL contingency mode. The following is the format of the level-zero-processed MGF data record for the GEOTAIL contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing MGF level-zero data from GEOTAIL minor frame 1	12	560–571
3	Subrecord 2 containing MGF level-zero data from GEOTAIL minor frame 2	12	572–583
4–512	Subrecord 3–511 containing MGF level-zero data from GEOTAIL minor frames 3–511	6108	584–6691
513	Subrecord 512 containing MGF level-zero data from GEOTAIL minor frame 512	12	6692–6703
Total record length: 6704 bytes (1676 words)			

The MGF instrument contingency subrecord format consists of a 12-byte logical subrecord for each minor frame in a major frame of telemetry. These 12 bytes correspond to the indicated 12 minor frame bytes of the GEOTAIL spacecraft contingency telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	20	21	22	23	24	25	26	27	28	29	64	65

3.1.3.1.3 LEP Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the GEOTAIL LEP instrument.

3.1.3.1.3.1 LEP Instrument Record Observation Data Record and Subrecord Formats

The LEP instrument generates 16 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL record observation mode. The following is the format of the level-zero-processed LEP data record for the GEOTAIL record observation mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing LEP level-zero data from GEOTAIL minor frame 1	16	560–575
3	Subrecord 2 containing LEP level-zero data from GEOTAIL minor frame 2	16	576–591
4–512	Subrecord 3–511 containing LEP level-zero data from GEOTAIL minor frames 3–511	8144	592–8735
513	Subrecord 512 containing LEP level-zero data from GEOTAIL minor frame 512	16	8736–8751
Total record length: 8752 bytes (2188 words)			

The LEP instrument record observation subrecord format consists of a 16-byte logical subrecord for each minor frame in a major frame of telemetry. These 16 bytes correspond to the indicated 16 minor frame bytes of the GEOTAIL spacecraft record observation telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8
Minor Frame Input Byte	32	33	34	35	36	37	38	39	40

Subrecord Output Byte	9	10	11	12	13	14	15
Minor Frame Input Byte	41	42	43	44	45	46	47

3.1.3.1.3.2 LEP Instrument Contingency Data Record and Subrecord Formats

The LEP instrument generates 27 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL contingency mode. The following is the format of the level-zero-processed LEP data record for the GEOTAIL contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing LEP level-zero data from GEOTAIL minor frame 1	27	560–586
3	Subrecord 2 containing LEP level-zero data from GEOTAIL minor frame 2	27	587–613
4–512	Subrecord 3–511 containing LEP level-zero data from GEOTAIL minor frames 3–511	13,743	614–14,356
513	Subrecord 512 containing LEP level-zero data from GEOTAIL minor frame 512	27	14,357–14,383
Total record length: 14,384 bytes (3596 words)			

The LEP instrument contingency subrecord format consists of a 27-byte logical subrecord for each minor frame in a major frame of telemetry. These 27 bytes correspond to the indicated 27 minor frame bytes of the GEOTAIL spacecraft contingency telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	37	38	39	40	41	42	43	44	45	46	47	48

Subrecord Output Byte	12	13	14	15	16	17	18	19	20	21	22	23
Minor Frame Input Byte	49	50	51	52	53	54	55	56	57	58	59	60

Subrecord Output Byte	24	25	26
Minor Frame Input Byte	61	62	63

3.1.3.1.4 HEP Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the GEOTAIL HEP instrument.

3.1.3.1.4.1 HEP Instrument Record Observation Data Record and Subrecord Formats

The HEP instrument generates 13 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL record observation mode. The following is the format of the level-zero-processed HEP data record for the GEOTAIL record observation mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing HEP level-zero data from GEOTAIL minor frame 1	13	560–572
3	Subrecord 2 containing HEP level-zero data from GEOTAIL minor frame 2	13	573–585
4–512	Subrecord 3–511 containing HEP level-zero data from GEOTAIL minor frames 3–511	6617	586–7202
513	Subrecord 512 containing HEP level-zero data from GEOTAIL minor frame 512	13	7203–7215
Total record length: 7216 bytes (1804 words)			

The HEP instrument record observation subrecord format consists of a 13-byte logical subrecord for each minor frame in a major frame of telemetry. These 13 bytes correspond to the indicated 13 minor frame bytes of the GEOTAIL spacecraft record observation telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11	12
Minor Frame Input Byte	48	49	50	51	52	53	54	55	56	57	58	59	60

3.1.3.1.4.2 HEP Instrument Contingency Data Record and Subrecord Formats

The HEP instrument generates 15 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL contingency mode. The following is the format of the level-zero-processed HEP data record for the GEOTAIL contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing HEP level-zero data from GEOTAIL minor frame 1	15	560–574
3	Subrecord 2 containing HEP level-zero data from GEOTAIL minor frame 2	15	575–589
4–512	Subrecord 3–511 containing HEP level-zero data from GEOTAIL minor frames 3–511	7635	590–8224
513	Subrecord 512 containing HEP level-zero data from GEOTAIL minor frame 512	15	8225–8239
Total record length: 8240 bytes (2060 words)			

The HEP instrument contingency subrecord format consists of a 15-byte logical subrecord for each minor frame in a major frame of telemetry. These 15 bytes correspond to the indicated 15 minor frame bytes of the GEOTAIL spacecraft contingency telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8
Minor Frame Input Byte	77	78	79	80	81	82	83	84	85

Subrecord Output Byte	9	10	11	12	13	14
Minor Frame Input Byte	86	87	88	89	90	91

3.1.3.1.5 PWI Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the GEOTAIL PWI instrument.

3.1.3.1.5.1 PWI Record Observation Data Record and Subrecord Formats

The PWI generates 11 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL record observation mode. The following is the format of the level-zero-processed PWI data record for the GEOTAIL record observation mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing PWI level-zero data from GEOTAIL minor frame 1	11	560–570
3	Subrecord 2 containing PWI level-zero data from GEOTAIL minor frame 2	11	571–581
4–512	Subrecord 3–511 containing PWI level-zero data from GEOTAIL minor frames 3–511	5599	582–6180
513	Subrecord 512 containing PWI level-zero data from GEOTAIL minor frame 512	11	6181–6191
Total record length: 6192 bytes (1548 words)			

The PWI record observation subrecord format consists of an 11-byte logical subrecord for each minor frame in a major frame of telemetry. These 11 bytes correspond to the indicated 11 minor frame bytes of the GEOTAIL spacecraft record observation telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	61	62	63	64	65	66	67	68	69	70	71

3.1.3.1.5.2 PWI Contingency Data Record and Subrecord Formats

The PWI generates 29 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL contingency mode. The following is the format of the level-zero-processed PWI data record for the GEOTAIL contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing PWI level-zero data from GEOTAIL minor frame 1	29	560–588
3	Subrecord 2 containing PWI level-zero data from GEOTAIL minor frame 2	29	589–617
4–512	Subrecord 3–511 containing PWI level-zero data from GEOTAIL minor frames 3–511	14,761	618–15,378
513	Subrecord 512 containing PWI level-zero data from GEOTAIL minor frame 512	29	15,379–15,407
Total record length: 15,408 bytes (3852 words)			

The PWI contingency subrecord format consists of a 29-byte logical subrecord for each minor frame in a major frame of telemetry. These 29 bytes correspond to the indicated 29 minor frame bytes of the GEOTAIL spacecraft contingency telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	30	31	32	33	34	35	36	92	93	94	95

Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20	21
Minor Frame Input Byte	96	97	98	99	100	101	102	103	104	105	106

Subrecord Output Byte	22	23	24	25	26	27	28
Minor Frame Input Byte	107	108	109	110	111	112	113

3.1.3.1.6 CPI Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the GEOTAIL CPI instrument.

3.1.3.1.6.1 CPI Instrument Record Observation Data Record and Subrecord Formats

The CPI instrument generates 36 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL record observation mode. The following is the format of the level-zero-processed CPI data record for the GEOTAIL record observation mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing CPI level-zero data from GEOTAIL minor frame 1	36	560–595
3	Subrecord 2 containing CPI level-zero data from GEOTAIL minor frame 2	36	596–631
4–512	Subrecord 3–511 containing CPI level-zero data from GEOTAIL minor frames 3–511	18,324	632–18,955
513	Subrecord 512 containing CPI level-zero data from GEOTAIL minor frame 512	36	18,956–18,991
Total record length: 18,992 bytes (4748 words)			

The CPI instrument record observation subrecord format consists of a 36-byte logical subrecord for each minor frame in a major frame of telemetry. These 36 bytes correspond to the indicated 36 minor frame bytes of the GEOTAIL spacecraft record observation telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	72	73	74	75	76	77	78	79	80	81	82	83

Subrecord Output Byte	12	13	14	15	16	17	18	19	20	21	22	23
Minor Frame Input Byte	84	85	86	87	88	89	90	91	92	93	94	95

Subrecord Output Byte	24	25	26	27	28	29	30	31	32	33	34	35
Minor Frame Input Byte	96	97	98	99	100	101	102	103	104	105	106	107

3.1.3.1.6.2 CPI Instrument Contingency Data Record and Subrecord Formats

The CPI instrument generates 9 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL contingency mode. The following is the format of the level-zero-processed CPI data record for the GEOTAIL contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing CPI level-zero data from GEOTAIL minor frame 1	9	560–568
3	Subrecord 2 containing CPI level-zero data from GEOTAIL minor frame 2	9	569–577

Item	Description	Length (bytes)	Record (bytes)
4–512	Subrecord 3–511 containing CPI level-zero data from GEOTAIL minor frames 3–511	4581	578–5158
513	Subrecord 512 containing CPI level-zero data from GEOTAIL minor frame 512	9	5159–5167
Total record length: 5168 bytes (1292 words)			

The CPI instrument contingency subrecord format consists of a 9-byte logical subrecord for each minor frame in a major frame of telemetry. These 9 bytes correspond to the indicated 9 minor frame bytes of the GEOTAIL spacecraft contingency telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8
Minor Frame Input Byte	114	115	116	117	118	119	120	121	122

3.1.3.1.7 EPIC Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the GEOTAIL EPIC instrument.

3.1.3.1.7.1 EPIC Instrument Record Observation Data Record and Subrecord Formats

The EPIC instrument generates 20 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL record observation mode. The following is the format of the level-zero-processed EPIC data record for the GEOTAIL record observation mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing EPIC level-zero data from GEOTAIL minor frame 1	20	560–579
3	Subrecord 2 containing EPIC level-zero data from GEOTAIL minor frame 2	20	580–599
4–512	Subrecord 3–511 containing EPIC level-zero data from GEOTAIL minor frames 3–511	10,180	600–10,779
513	Subrecord 512 containing EPIC level-zero data from GEOTAIL minor frame 512	20	10,780–10,799
Total record length: 10,800 bytes (2700 words)			

The EPIC instrument record observation subrecord format consists of a 20-byte logical subrecord for each minor frame in a major frame of telemetry. These 20 bytes correspond to the indicated 20 minor frame bytes of the GEOTAIL spacecraft record observation telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	108	109	110	111	112	113	114	115	116	117

Subrecord Output Byte	10	11	12	13	14	15	16	17	18	19
Minor Frame Input Byte	118	119	120	121	122	123	124	125	126	127

3.1.3.1.7.2 EPIC Instrument Contingency Data Record and Subrecord Formats

The EPIC instrument generates 5 bytes of telemetry in each GEOTAIL minor frame during GEOTAIL contingency mode. The following is the format of the level-zero-processed EPIC data record for the GEOTAIL contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing EPIC level-zero data from GEOTAIL minor frame 1	5	560–564
3	Subrecord 2 containing EPIC level-zero data from GEOTAIL minor frame 2	5	565–569
4–512	Subrecord 3–511 containing EPIC level-zero data from GEOTAIL minor frames 3–511	2545	570–3114
513	Subrecord 512 containing EPIC level-zero data from GEOTAIL minor frame 512	5	3115–3119
Total record length: 3120 bytes (780 words)			

The EPIC instrument contingency subrecord format consists of a 5-byte logical subrecord for each minor frame in a major frame of telemetry. These 5 bytes correspond to the indicated 5 minor frame bytes of the GEOTAIL spacecraft contingency telemetry format.

Subrecord Output Byte	0	1	2	3	4
Minor Frame Input Byte	123	124	125	126	127

3.1.3.2 WIND Spacecraft Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for each instrument onboard the WIND spacecraft.

Formats are provided for two WIND spacecraft telemetry modes: science telemetry (usual) and maneuver. **Note that the formats used in WIND contingency science telemetry mode are identical to those used in WIND science mode**. The telemetry mode is indicated in the DRH. Maneuver mode is used when the WIND spacecraft attitude control is not sufficiently stable to permit accurate attitude determination for normal science data collection. In this mode, the spin rate varies and the spacecraft attitude is not stable or accurately known. Therefore, the onboard instruments are unable to determine their orientation in space with accuracy. Also, for extreme rate deviations (greater than 10%), the spin phase clock and reference pulse are inaccurate. During maneuver mode, additional bytes of telemetry are allocated to the attitude control system. Figure 3–3 depicts the high level telemetry format for the WIND spacecraft. The detailed telemetry formats for the WIND spacecraft are available in Reference 8. Note that a major frame contains 250 minor frames (numbered 0–249) of 256 bytes (numbered 0–255) each.

NRT level-zero data is generated on the CDHF but not distributed to the DDF. The format of the NRT level-zero data is identical to the format of the production level-zero data originating from the GDCF. Because of the NRT system operation, the record size for each instrument's NRT level zero is set to the largest record size possible for the instrument. For example, if the production 3DPA level-zero data record size is 12,800 bytes during science telemetry mode and 9,300 bytes during maneuver telemetry mode, the record size for 3DPA NRT level-zero data is always 12,800 bytes (the larger of the two record sizes). In cases where the NRT record size for the current telemetry mode is less than the maximum, the remaining bytes in the record are zero-filled.

Note that the following sections specify, for each instrument onboard the WIND spacecraft, which telemetry of each minor frame are allocated to the instrument. With the exception of the housekeeping bytes (17 and 18) and the subcom byte (19), the above bytes called fixed column bytes, of every minor frame are allocated to the instrument. Notes are used to indicate which minor frames contain housekeeping and subcom bytes for the instrument.

3.1.3.2.1 3D Plasma Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the WIND 3D Plasma instrument.

Byte → / Minor Frame ↓				Instru- ment HK		Subcom		Fixed-Column Bytes					
0	0	1	•	17	18	19	20	21	22	•	•	254	255
1													
•													
•													
249													

Figure 3–3. WIND Major Frame Telemetry Format

3.1.3.2.1.1 3D Plasma Instrument Science and Contingency Telemetry Data Record and Subrecord Formats

The 3D Plasma instrument generates 50 bytes of telemetry in each WIND minor frame during WIND science or contingency science telemetry mode. The following is the format of the level-zero-processed 3D Plasma data record for the WIND science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing 3D Plasma level-zero data from WIND minor frame 0	50	300–349
3	Subrecord 2 containing 3D Plasma level-zero data from WIND minor frame 1	50	350–399
4–250	Subrecord 3–249 containing 3D Plasma level-zero data from WIND minor frames 2–248	12,350	400–12749
251	Subrecord 250 containing 3D Plasma level-zero data from WIND minor frame 249	50	12,750–12,799
Total record length: 12,800 bytes (3200 words)			

The 3D Plasma instrument science or contingency science telemetry format consists of a 50-byte logical subrecord for each minor frame of input telemetry. These 50 bytes correspond to the indicated 50 minor frame bytes of the GGS WIND spacecraft telemetry format.

	HK		Subcom	Fixed-Column Science Allocation								
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	17	18	19	23	27	31	35	39	43	47	51	55

	Fixed-Column Science Allocation											
Subrecord Output Byte	12	13	14	15	16	17	18	19	20	21	22	23
Minor Frame Input Byte	59	63	67	71	75	79	83	87	91	95	99	103

	Fixed-Column Science Allocation											
Subrecord Output Byte	24	25	26	27	28	29	30	31	32	33	34	35
Minor Frame Input Byte	107	111	115	119	123	127	131	135	139	143	147	151

	Fixed-Column Science Allocation													
Subrecord Output Byte	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Minor Frame Input Byte	155	159	163	167	171	175	179	183	187	191	195	199	203	207

Notes: 1. The instrument housekeeping (HK) byte 17 is allocated to the 3D Plasma instrument in minor frames 6, 9, 16, 19, 26, 29, 36, 39, 46, 49, 56, 59, 66, 69, 76, 79, 86, 89, 96, 99, 106, 109, 116, 119, 126, 129, 136, 139, 146, 149, 156, 159, 166, 169, 176, 179, 186, 189, 196, 199, 206, 209, 216, 219, 226, 229, 236, 239, 246, 249. The corresponding output byte (0) is zero-filled in the remaining subrecords. The instrument HK byte 18 is allocated to the 3D Plasma instrument in minor frames 26, 36, 46, and 56. The corresponding output byte (1) is zero-filled in the remaining subrecords. Note that this data is entered by the spacecraft computer. It does not come from the instrument.

2. The subcom(loose) byte 19 is allocated to the 3D Plasma instrument in minor frames 1, 3, 5, 7, 11, 13, 15, 17, 21, 23, 25, 27, 31, 33, 35, 37, 41, 43, 45, 47, 51, 53, 55, 57, 61, 63, 65, 67, 71, 73, 75, 77, 81, 83, 85, 87, 91, 93, 95, 97, 101, 103, 105, 107, 111, 113, 115, 117, 121, 123, 125, 127, 131, 133, 135, 137, 141, 143, 145, 147, 151, 153, 155, 157, 161, 163, 165, 167, 171, 173, 175, 177, 181, 183, 185, 187, 191, 193, 195, 197, 201, 203, 205, 207, 211, 213, 215, 217, 221, 223, 225, 227, 231, 233, 235, 237, 241, 243, 245, and 247. The corresponding output byte (2) is zero-filled in the remaining subrecords.

3. The listed science allocation bytes are allocated to the 3D Plasma instrument in minor frames 0–249.

3.1.3.2.1.2 3D Plasma Instrument Maneuver Mode Data Record and Subrecord Formats

The 3D Plasma instrument generates 36 bytes of telemetry in each WIND minor frame during WIND maneuver mode. The following is the format of the level-zero-processed 3D Plasma data record for the WIND maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing 3D PLASMA level-zero data from WIND minor frame 0	36	300–335
3	Subrecord 2 containing 3D PLASMA level-zero data from WIND minor frame 1	36	366–371
4–250	Subrecord 3–249 containing 3D PLASMA level-zero data from WIND minor frames 2–248	8892	372–9263
251	Subrecord 250 containing 3D PLASMA level-zero data from WIND minor frame 249	36	9264–9299
Total record length: 9300 bytes (2325 words)			

The 3D Plasma instrument maneuver mode telemetry subrecord consists of a 36-byte logical subrecord for each minor frame of input telemetry. These 36 bytes correspond to the indicated 36 bytes of the GGS WIND maneuver mode telemetry format.

	HK		Sub-com	Fixed-Column Science Allocation										
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Minor Frame Input Byte	17	18	19	35	39	43	51	55	59	67	71	75	83	87

	Fixed-Column Science Allocation										
Subrecord Output Byte	14	15	16	17	18	19	20	21	22	23	24
Minor Frame Input Byte	91	99	103	107	115	119	123	131	135	139	147

	Fixed-Column Science Allocation										
Subrecord Output Byte	25	26	27	28	29	30	31	32	33	34	35
Minor Frame Input Byte	151	155	163	167	171	179	183	187	195	199	203

Notes:
1. The instrument HK byte 17 is allocated to the 3D Plasma instrument in minor frames 6, 9, 16, 19, 26, 29, 36, 39, 46, 49, 56, 59, 66, 69, 76, 79, 86, 89, 96, 99, 106, 109, 116, 119, 126, 129, 136, 139, 146, 149, 156, 159, 166, 169, 176, 179, 186, 189, 196, 199, 206, 209, 216, 219, 226, 229, 236, 239, 246, 249. The instrument HK byte 18 is allocated to the 3D Plasma instrument in minor frames 26, 36, 46, and 56. The corresponding output bytes (0 and1) are zero-filled in the remaining subrecords. Note that this data is entered by the spacecraft computer. It does not come from the instrument.
2. The subcom(loose) byte 19 is allocated to the 3D Plasma instrument in minor frames 1, 3, 5, 7, 11, 13, 15, 17, 21, 23, 25, 27, 31, 33, 35, 37, 41, 43, 45, 47, 51, 53, 55, 57, 61, 63, 65, 67, 71, 73, 75, 77, 81, 83, 85, 87, 91, 93, 95, 97, 101, 103, 105, 107, 111, 113, 115, 117, 121, 123, 125, 127, 131, 133, 135, 137, 141, 143, 145, 147, 151, 153, 155, 157, 161, 163, 165, 167, 171, 173, 175, 177, 181, 183, 185, 187, 191, 193, 195, 197, 201, 203, 205, 207, 211, 213, 215, 217, 221, 223, 225, 227, 231, 233, 235, 237, 241, 243, 245, and 247. The corresponding output byte (2) is zero-filled in the remaining subrecords.
3. The listed science allocation bytes are allocated to the 3D Plasma instruments in minor frames 0–249.

3.1.3.2.2 EPACT Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the WIND EPACT instrument.

3.1.3.2.2.1 EPACT Instrument Science and Contingency Science Telemetry Data Record and Subrecord Formats

The EPACT instrument generates 24 bytes of telemetry in each WIND minor frame during WIND science or contingency science telemetry mode. Note that EPACT's allocation is divided between ELITE and EP/LEMT. The following is the format of the level-zero-processed EPACT data record for the WIND science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing EPACT level-zero data from WIND minor frame 0	24	300–323
3	Subrecord 2 containing EPACT level-zero data from WIND minor frame 1	24	324–347
4–250	Subrecord 3–249 containing EPACT level-zero data from WIND minor frames 2–248	5,928	348–6275
251	Subrecord 250 containing EPACT level-zero data from WIND minor frame 249	24	6276–6299
Total record length: 6300 bytes (1575 words)			

The EPACT instrument science or contingency science telemetry format consists of a 24-byte logical subrecord for each minor frame of input telemetry. These 24 bytes, which are split between ELITE and EP/LEMT, correspond to the indicated 24 minor frame bytes of the GGS WIND spacecraft telemetry format.

	HK		EPACT	EP/LEMT Fixed-Column Science Allocation								
	EP/ LEMT	ELITE	Subcom									
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	17	18	20	182	186	190	194	196	198	201	205	209

	EPACT Fixed-Column Science Allocation											
Subrecord Output Byte	12	13	14	15	16	17	18	19	20	21	22	23
Minor Frame Input Byte	211	213	215	217	219	221	223	225	227	229	231	233

Notes:
1. The instrument HK byte 17 is allocated to the EPACT EP/LEMT instrument in minor frames 2, 12, 22, 32, 42, 52, 62, 72, 82, 92, 102, 112, 122, 132, 142, 152, 162, 172, 182, 192, 202, 212, 222, 232, and 242. Byte 18 is allocated to the EPACT ELITE instrument in minor frames 2, 6, 12, 16, 22, 32, 42, 52, 62, 72, 82, 92, 102, 112, 122, 126, 132, 136, 142, 146, 152, 156, 162, 166, 172, 176, 182, 186, 192, 196, 202, 206, 212, 216, 222, 226, 232, 236, 242, and 246. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.
2. The subcom(loose) byte 20 is allocated to the EPACT instrument in minor frames 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 100, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 120, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 140, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 160, 161, 163, 165, 167, 169, 170, 171, 173, 175, 177, 179, 180, 181, 183, 185, 187, 189, 190, 191, 193, 195,

197, 199, 200, 201, 203, 205, 207, 209, 210, 211, 213, 215, 217, 219, 220, 221, 223, 225, 227, 229, 230, 231, 233, 235, 237, 239, 240, 241, 243, 245, 247, and 249. The corresponding output bytes (2 and 3) are zero-filled in the remaining subrecords.

3. The listed science allocation bytes are allocated to the EPACT instruments in minor frames 0–249.

3.1.3.2.2.2 EPACT Instrument Maneuver Mode Data Record and Subrecord Formats

The EPACT instrument generates 23 bytes of telemetry in each WIND minor frame during WIND maneuver mode. The following is the format of the level-zero-processed EPACT data record for the WIND maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing EPACT level-zero data from WIND minor frame 0	23	300–322
3	Subrecord 2 containing EPACT level-zero data from WIND minor frame 1	23	323–345
4–250	Subrecord 3–249 containing EPACT level-zero data from WIND minor frames 2–248	5681	346–6026
251	Subrecord 250 containing EPACT level-zero data from WIND minor frame 249	23	6027–6049
252	Zero (null) fill bytes to pad out to 4-byte word boundary	2	6050–6051
Total record length: 6052 bytes (1513 words)			

The EPACT instrument maneuver mode telemetry subrecord consists of a 23-byte logical subrecord for each minor frame of telemetry. These 23 bytes, which are split between ELITE and LEMT, correspond to the indicated 23 bytes of the GGS WIND maneuver mode telemetry format.

	HK		Subcom	EP/LEMT Fixed-Column Science Allocation								
	EP/ LEMT	ELITE	EP/ LEMT/ EPACT									
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	17	18	20	182	186	190	194	196	198	201	205	209

	EPACT Fixed-Column Science Allocation										
Subrecord Output Byte	12	13	14	15	16	17	18	19	20	21	22
Minor Frame Input Byte	211	213	215	217	219	221	225	227	229	231	233

Notes: 1. The instrument HK byte 17 is allocated to the EP/LEMT instrument in minor frames 2, 12, 22, 32, 42, 52, 62, 72, 82, 92, 102, 112, 122, 132, 142, 152, 162, 172, 182, 192, 202, 212, 222, 232, and 242. HK byte 18 is allocated to the ELITE instrument in the same minor frames and minor frames 6, 16, 126, 136, 146, 156, 166, 176, 186, 196, 206, 216, 226, 236, 242, and 246. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The subcom(loose) byte 20 is allocated to the EPACT instrument in minor frames 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 100, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 120, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 140, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 160, 161, 163, 165, 167, 169, 170, 171, 173, 175, 177, 179, 180, 181, 183, 185, 187, 189, 190, 191, 193, 195, 197, 199, 200, 201, 203, 205, 207, 209, 210, 211, 213, 215, 217, 219, 220, 221, 223, 225, 227, 229, 230, 231, 233, 235, 237, 239, 240, 241, 243, 245, 247, and 249. The corresponding output bytes (2 and 3) are zero-filled in the remaining subrecords.

3. The listed science allocation bytes are allocated to the EPACT instruments in minor frames 0–249.

3.1.3.2.3 KONUS Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the WIND KONUS instrument.

3.1.3.2.3.1 KONUS Instrument Science and Contingency Science Telemetry Data Record and Subrecord Formats

The KONUS instrument generates 6 bytes of telemetry in each WIND minor frame during WIND science or contingency science telemetry mode. The following is the format of the level-zero-processed KONUS data record for the WIND science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing KONUS level-zero data from WIND minor frame 0	6	300–305
3	Subrecord 2 containing KONUS level-zero data from WIND minor frame 1	6	306–311
4–250	Subrecord 3–249 containing KONUS level-zero data from WIND minor frames 2–248	1482	312–1793
251	Subrecord 250 containing KONUS level-zero data from WIND minor frame 249	6	1794–1799
252	Zero (null) fill bytes to pad out to minimum record length	992	1800–2791
Total record length: 2792 bytes (698 words)			

The KONUS instrument science or contingency science telemetry format consists of a 6-byte logical subrecord for each minor frame of input telemetry. These 6 bytes correspond to the indicated 6 minor frame bytes of the GGS WIND space craft telemetry format.

	HK		Subcom		Fixed-Column Science Allocation	
Subrecord Output Byte	0	1	2	3	4	5
Minor Frame Input Byte	17	18	19	20	193	197

Notes: 1. The instrument HK bytes 17 and 18 are allocated to the KONUS instrument in minor frames 5, 15, 25, 35, 45, 55, 65, 75, 85, 95, 105, 115, 125, 135, 145, 155, 165, 175, 185, 195, 205, 215, 225, 235, and 245. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The subcom (loose) bytes 19 and 20 are allocated to the KONUS instrument in minor frames 4, 6, 10, 14, 16, 24, 26, 30, 34, 36, 44, 46, 50, 54, 56, 64, 66, 70, 74, 76, 84, 86, 90, 94, 96, 104, 106, 110, 114, 116, 124, 126, 130, 134, 136, 144, 146, 150, 154, 156, 164, 166, 174, 176, 184, 186, 194, 196, 204, 206, 214, 216, 224, 226, 234, 236, 244, and 246. The subcom byte 19 is also allocated to the KONUS instrument in minor frames 100, 120, 140, 160, 170, 180, 190, 200, 210, 220, 230, and 240. The corresponding output bytes (2 and 3) are zero-filled in the remaining subrecords.

3. The listed science allocation bytes are allocated to the KONUS instrument in minor frames 0–249.

3.1.3.2.3.2 KONUS Maneuver Mode Data Record and Subrecord Formats

The KONUS instrument generates 6 bytes of telemetry in each WIND minor frame during WIND maneuver mode. The following is the format of the level-zero-processed KONUS data record for the WIND maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing KONUS level-zero data from WIND minor frame 0	6	300–305
3	Subrecord 2 containing KONUS level-zero data from WIND minor frame 1	6	306–311
4–250	Subrecord 3–249 containing KONUS level-zero data from WIND minor frames 2–248	1482	312–1793
251	Subrecord 250 containing KONUS level-zero data from WIND minor frame 249	6	1794–1799
252	Zero (null) fill bytes to pad out to minimum record length	992	1800–2791
Total record length: 2792 bytes (698 words)			

The KONUS instrument maneuver mode telemetry subrecord consists of a 6-byte logical subrecord for each minor frame of telemetry. These 6 bytes correspond to the indicated 6 bytes of the GGS WIND maneuver mode telemetry format.

	HK		Subcom		Fixed-Column Science Allocation	
Subrecord Output Byte	0	1	2	3	4	5
Minor Frame Input Byte	17	18	19	20	193	197

Notes: 1. The instrument HK bytes 17 and 18 are allocated to the KONUS instrument in minor frames 5, 15, 25, 35, 45, 55, 65, 75, 85, 95, 105, 115, 125, 135, 145, 155, 165, 175, 185, 195, 205, 215, 225, 235, and 245. The corresponding output bytes (0 and1) are zero-filled in the remaining subrecords.

2. The subcom (loose) bytes 19 and 20 are allocated to the KONUS instrument in minor frames 4, 6, 10, 14, 16, 24, 26, 30, 34, 36, 44, 46, 50, 54, 56, 64, 66, 70, 74, 76, 84, 86, 90, 94, 96, 104, 106, 110, 114, 116, 124, 126, 130, 134, 136, 144, 146, 150, 154, 156, 164, 166, 174, 176, 184, 186, 194, 196, 204, 206, 214, 216, 224, 226, 234, 236, 244, and 246. The subcom byte 19 is also allocated to the KONUS instrument in minor frames 100, 120, 140, 160, 170, 180, 190, 200, 210, 220, 230, and 240. The corresponding output bytes (2 and 3) are zero-filled in the remaining subrecords.

3. The listed science allocation bytes are allocated to the KONUS instrument in minor frames 0–249.

3.1.3.2.4 MFI Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the WIND MFI instrument.

3.1.3.2.4.1 MFI Instrument Science and Contingency Science Telemetry Data Record and Subrecord Formats

The MFI instrument generates 25 bytes of telemetry in each WIND minor frame during WIND science or contingency science telemetry mode. The following is the format of the level-zero-processed MFI data record for the WIND science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing MFI level-zero data from WIND minor frame 0	25	300–324
3	Subrecord 2 containing MFI level-zero data from WIND minor frame 1	25	325–349
4–250	Subrecord 3–249 containing MFI level-zero data from WIND minor frames 2–248	6175	350–6524
251	Subrecord 250 containing MFI level-zero data from WIND minor frame 249	25	6525–6549

Item	Description	Length (bytes)	Record (bytes)
252	Zero (null) fill bytes to pad out to 4-byte word boundary	2	6550–6551
Total record length: 6552 bytes (1638 words)			

The MFI instrument science or contingency science telemetry format consists of a 25-byte logical subrecord for each minor frame of input telemetry. These 25 bytes correspond to the indicated 25 minor frame bytes of the GGS WIND spacecraft telemetry format.

	HK		Subcom	Fixed-Column Science Allocation							
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	17	18	20	234	235	236	237	238	239	240	241

	Fixed-Column Science Allocation										
Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20	21
Minor Frame Input Byte	242	243	244	245	246	247	248	249	250	251	252

	Fixed-Column Science Allocation		
Subrecord Output Byte	22	23	24
Minor Frame Input Byte	253	254	255

Notes:
1. The instrument HK bytes 17 and 18 are allocated to the MFI instrument in minor frames 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, and 240. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.
2. The subcom(loose) byte 20 is allocated to the MFI instrument in minor frames 2, 12, 22, 32, 42, 52, 62, 72, 82, 92, 102, 112, 122, 132, 142, 152, 162, 172, 182, 192, 202, 212, 222, 232, and 242. The corresponding output byte (2) is zero-filled in the remaining subrecords.

3.1.3.2.4.2 MFI Instrument Maneuver Mode Data Record and Subrecord Format

The MFI instrument generates 23 bytes of telemetry in each WIND minor frame during WIND maneuver mode. The following is the format of the level-zero-processed MFI data record for the WIND maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing MFI level-zero data from WIND minor frame 0	23	300–322

Item	Description	Length (bytes)	Record (bytes)
3	Subrecord 2 containing MFI level-zero data from WIND minor frame 1	23	323–345
4–250	Subrecord 3–249 containing MFI level-zero data from WIND minor frames 2–248	5681	346–6026
251	Subrecord 250 containing MFI level-zero data from WIND minor frame 249	23	6027–6049
252	Zero (null) fill bytes to pad out to 4-byte word boundary	2	6050–6051
Total record length: 5800 bytes (1450 words)			

The MFI instrument maneuver mode telemetry subrecord consists of a 23-byte logical subrecord for each minor frame of telemetry. These 23 bytes correspond to the indicated 23 bytes of the GGS WIND maneuver mode telemetry format.

	HK		Sub-com	Fixed-Column Science Allocation										
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Minor Frame Input Byte	17	18	20	234	235	236	237	238	240	241	242	243	244	245

	Fixed-Column Science Allocation								
Subrecord Output Byte	14	15	16	17	18	19	20	21	22
Minor Frame Input Byte	246	247	248	249	250	251	252	253	254

Notes:
1. The instrument HK bytes 17 and 18 are allocated to the MFI instrument in minor frames 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, and 240. The corresponding output bytes (0 and1) are zero-filled in the remaining subrecords.
2. The subcom(loose) byte 20 is allocated to the MFI instrument in minor frames 2, 12, 22, 32, 42, 52, 62, 72, 82, 92, 102, 112, 122, 132, 142, 152, 162, 172, 182, 192, 202, 212, 222, 232, and 242. The corresponding output byte (2) is zero-filled in the remaining subrecords.
3. The listed science allocation bytes are allocated to the MFI instrument in minor frames 0–249.

3.1.3.2.5 SMS Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the WIND SMS instrument.

3.1.3.2.5.1 SMS Instrument Science and Contingency Science Telemetry Data Record and Subrecord Formats

The SMS instrument generates 42 bytes of telemetry in each WIND minor frame during WIND science or contingency science telemetry mode. The following is the format of the level-zero-processed SMS data record for the WIND science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing SMS level-zero data from WIND minor frame 0	42	300–341
3	Subrecord 2 containing SMS level-zero data from WIND minor frame 1	42	342–383
4–250	Subrecord 3–249 containing SMS level-zero data from WIND minor frames 2–248	10,374	384–10,757
251	Subrecord 250 containing SMS level-zero data from WIND minor frame 249	42	10,758–10,799
Total record length: 10,800 bytes (2700 words)			

The SMS instrument science or contingency science telemetry format consists of a 42-byte logical subrecord for each minor frame of input telemetry. These 42 bytes correspond to the indicated 42 minor frame bytes of the GGS WIND spacecraft telemetry format.

	HK		Fixed-Column Science Allocation									
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	17	18	22	26	30	34	38	42	46	50	54	58

	Fixed-Column Science Allocation											
Subrecord Output Byte	12	13	14	15	16	17	18	19	20	21	22	23
Minor Frame Input Byte	62	66	70	74	78	82	86	90	94	98	102	106

	Fixed-Column Science Allocation											
Subrecord Output Byte	24	25	26	27	28	29	30	31	32	33	34	35
Minor Frame Input Byte	110	114	118	122	126	130	134	138	142	146	150	154

	Fixed-Column Science Allocation					
Subrecord Output Byte	36	37	38	39	40	41
Minor Frame Input Byte	158	162	166	170	174	178

Notes: 1. The HK byte 17 is allocated to SMS in minor frames 1, 11, 21, 31, 41, 51, 61, 71, 81, 91, 101, 111, 121, 131, 141, 151, 161, 171, 181, 191, 201, 211, 221, 231, and 241. The instrument HK byte 18 is allocated to the SMS in minor frames 3, 7, 13, 17, 23, 27, 33, 37, 43, 47, 53, 57, 63, 67, 73, 77, 83, 87, 93, 97, 103, 107, 113, 117, 123, 127, 133, 137, 143, 147, 153, 157, 163, 167, 173, 177, 183, 187, 193, 197, 203, 207, 213, 217, 223, 227, 233, 237, 243, and 247. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The listed science allocation bytes are allocated to the SMS instrument in minor frames 0–249.

3.1.3.2.5.2 SMS Instrument Maneuver Mode Data Record and Subrecord Formats

The SMS instrument generates 35 bytes of telemetry in the WIND minor frame during WIND maneuver mode. The following is the format of the level-zero-processed SMS data record for the WIND maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing SMS level-zero data from WIND minor frame 0	35	300–334
3	Subrecord 2 containing SMS level-zero data from WIND minor frame 1	35	335–369
4–250	Subrecord 3–249 containing SMS level-zero data from WIND minor frames 2–248	8645	370–9014
251	Subrecord 250 containing SMS level-zero data from WIND minor frame 249	35	9015–9049
252	Zero (null) fill bytes to pad out to 4-byte word boundary	2	9050–9051
Total record length: 9052 bytes (2263 words)			

The SMS instrument maneuver mode telemetry subrecord consists of a 35-byte logical subrecord for each minor frame of telemetry. These 35 bytes correspond to the indicated 35 bytes of the GGS WIND maneuver mode telemetry format.

	HK		Fixed-Column Science Allocation										
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11	12
Minor Frame Input Byte	17	18	34	38	42	46	50	54	58	62	66	70	74

	Fixed-Column Science Allocation										
Subrecord Output Byte	13	14	15	16	17	18	19	20	21	22	23
Minor Frame Input Byte	78	82	86	90	94	98	102	106	110	114	118

	Fixed-Column Science Allocation										
Subrecord Output Byte	24	25	26	27	28	29	30	31	32	33	34
Minor Frame Input Byte	122	126	130	134	138	142	146	150	154	158	162

Notes: 1. The HK byte 17 is allocated to SMS in minor frames 1, 11, 21, 31, 41, 51, 61, 71, 81, 91, 101, 111, 121, 131, 141, 151, 161, 171, 181, 191, 201, 211, 221, 231, and 241. The instrument HK byte 18 is allocated to the SMS in minor frames 3, 7, 13, 17, 23, 27, 33, 37, 43, 47, 53, 57, 63, 67, 73, 77, 83, 87, 93, 97, 103, 107, 113, 117, 123, 127, 133, 137, 143, 147, 153, 157, 163, 167, 173, 177, 183, 187, 193, 197, 203, 207, 213, 217, 223, 227, 233, 237, 243, and 247. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The tested science allocation bytes are allocated to the SMS instrument in minor frames 0–249.

3.1.3.2.6 SWE Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the WIND SWE instrument.

3.1.3.2.6.1 SWE Instrument Science and Contingency Science Telemetry Data Record and Subrecord Formats

The SWE instrument generates 45 bytes of telemetry in each WIND minor frame during WIND science or contingency science telemetry mode. The following is the format of the level-zero-processed SWE data record for the WIND science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing SWE level-zero data from WIND minor frame 0	45	300–344
3	Subrecord 2 containing SWE level-zero data from WIND minor frame 1	45	345–389
4–250	Subrecord 3–249 containing SWE level-zero data from WIND minor frames 2–248	11,115	390–11,504
251	Subrecord 250 containing SWE level-zero data from WIND minor frame 249	45	11,505–11,549
252	Zero (null) fill bytes to pad record out to 4-byte word boundary	2	11,550–11,551
Total record length: 11,552 bytes (2888 words)			

The SWE instrument science or contingency science telemetry format consists of a 45-byte logical subrecord for each minor frame of input telemetry. These 45 bytes correspond to the indicated 45 minor frame bytes of the GGS WIND spacecraft telemetry format.

	HK	Subcom	Fixed-Column Science Allocation									
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	17	19	21	25	29	33	37	41	45	49	53	57

	Fixed-Column Science Allocation											
Subrecord Output Byte	12	13	14	15	16	17	18	19	20	21	22	23
Minor Frame Input Byte	61	65	69	73	77	81	85	89	93	97	101	105

	Fixed-Column Science Allocation											
Subrecord Output Byte	24	25	26	27	28	29	30	31	32	33	34	35
Minor Frame Input Byte	109	113	117	121	125	129	133	137	141	145	149	153

	Fixed-Column Science Allocation								
Subrecord Output Byte	36	37	38	39	40	41	42	43	44
Minor Frame Input Byte	157	161	165	169	173	177	181	185	189

Notes:
1. The instrument HK byte 17 is allocated to the SWE instrument in minor frames 3, 7, 13, 17, 23, 27, 33, 37, 43, 47, 53, 57, 63, 67, 73, 77, 83, 87, 93, 97, 103, 107, 113, 117, 123, 127, 133, 137, 143, 147, 153, 157, 163, 167, 173, 177, 183, 187, 193, 197, 203, 207, 213, 217, 223, 227, 233, 237, 243, and 247. The corresponding output byte (0) is zero-filled in the remaining subrecords.
2. The subcom (loose) byte 19 is allocated to the SWE instrument in minor frames 2, 9, 12, 19, 22, 29, 32, 39, 42, 49, 52, 59, 62, 69, 72, 79, 82, 89, 92, 99, 102, 109, 112, 119, 122, 129, 132, 139, 142, 149, 152, 159, 162, 169, 172, 179, 182, 189, 192, 199, 202, 209, 212, 219, 222, 229, 232, 239, 242, and 249. The corresponding output byte (1) is zero-filled in the remaining subrecords.
3. The listed science allocation bytes to the SWE instrument in minor frames 0–249.

3.1.3.2.6.2 SWE Instrument Maneuver Mode Record and Subrecord Formats

The SWE instrument generates 2 bytes of telemetry in each WIND minor frame during WIND maneuver mode. The following is the format of the level-zero-processed SWE data record for the WIND maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing SWE level-zero data from WIND minor frame 0	2	300–301
3	Subrecord 2 containing SWE level-zero data from WIND minor frame 1	2	302–303

Item	Description	Length (bytes)	Record (bytes)
4–250	Subrecord 3–249 containing SWE level-zero data from WIND minor frames 2–248	494	304–797
251	Subrecord 250 containing SWE level-zero data from WIND minor frame 249	2	798–799
252	Zero (null) fill bytes to pad out to minimum record length	1992	800–2791
Total record length: 2792 bytes (698 words)			

The SWE instrument maneuver mode telemetry subrecord consists of a 2-byte logical subrecord for each minor frame of telemetry. These 2 bytes correspond to the indicated 2 bytes of the GGS WIND maneuver mode telemetry format.

	HK	Subcom
Subrecord Output Byte	0	1
Minor Frame Input Byte	17	19

Notes:
1. The instrument HK byte 17 is allocated to the SWE instrument in minor frames 3, 7, 13, 17, 23, 27, 33, 37, 43, 47, 53, 57, 63, 67, 73, 77, 83, 87, 93, 97, 103, 107, 113, 117, 123, 127, 133, 137, 143, 147, 153, 157, 163, 167, 173, 177, 183, 187, 193, 197, 203, 207, 213, 217, 223, 227, 233, 237, 243, and 247. The corresponding output byte (0) is zero-filled in the remaining subrecords.
2. The subcom (loose) byte 19 is allocated to the SWE instrument in minor frames 2, 9, 12, 19, 22, 29, 32, 39, 42, 49, 52, 59, 62, 69, 72, 79, 82, 89, 92, 99, 102, 109, 112, 119, 122, 129, 132, 139, 142, 149, 152, 159, 162, 169, 172, 179, 182, 189, 192, 199, 202, 209, 212, 219, 222, 229, 232, 239, 242, and 249. The corresponding output byte 1 is zero-filled in the remaining subrecords.
3. No fixed column science allocation bytes are allocated to the SWE instrument.

3.1.3.2.7 TGRS Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the WIND TGRS instrument.

3.1.3.2.7.1 TGRS Instrument Science and Contingency Science Telemetry Data Record and Subrecord Formats

The TGRS instrument generates 21 bytes of telemetry in each WIND minor frame during WIND science or contingency science telemetry mode. The following is the format of the level-zero-processed TGRS data record for the WIND science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing TGRS level-zero data from WIND minor frame 0	21	300–320
3	Subrecord 2 containing TGRS level-zero data from WIND minor frame 1	21	321–341
4–250	Subrecord 3–249 containing TGRS level-zero data from WIND minor frames 2–248	5187	342–5528
251	Subrecord 250 containing TGRS level-zero data from WIND minor frame 249	21	5529–5549
252	Zero (null) fill bytes to pad out to 4-byte word boundary	2	5550–5551
Total record length: 5552 bytes (1388 words)			

The TGRS instrument science or contingency science telemetry format consists of a 21-byte logical subrecord for each minor frame of input telemetry. These 21 bytes correspond to the indicated 21 minor frame bytes of the GGS WIND spacecraft telemetry format.

	HK		Subcom		Fixed-Column Science Allocation						
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	17	18	19	20	200	202	204	206	208	210	212

	Fixed-Column Science Allocation									
Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20
Minor Frame Input Byte	214	216	218	220	222	224	226	228	230	232

Notes:
1. The instrument HK bytes 17 and 18 are allocated to the TGRS instrument in minor frames 8, 18, 28, 38, 48, 58, 68, 78, 88, 98, 108, 118, 128, 138, 148, 158, 168, 178, 188, 198, 208, 218, 228, 238, and 248. The corresponding output bytes (0 and 1) are zero-filled in the remaining records.
2. The subcom (loose) bytes 19 and 20 are allocated to the TGRS instrument in minor frames 0, 8, 18, 20, 28, 38, 40, 48, 58, 60, 68, 78, 80, 88, 98, 108, 118, 128, 138, 148, 158, 168, 178, 188, 198, 208, 218, 228, 238, and 248. The corresponding output bytes (2 and 3) are zero-filled in the remaining subrecords.
3. The listed science allocation bytes are allocated to the TGRS instrument in minor frames 0–249.

3.1.3.2.7.2 TGRS Instrument Maneuver Mode Data Record and Subrecord Formats

The TGRS instrument generates 21 bytes of telemetry in each WIND minor frame during WIND maneuver mode. The following is the format of the level-zero-processed TGRS data record for the WIND maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing TGRS level-zero data from WIND minor frame 0	21	300–320
3	Subrecord 2 containing TGRS level-zero data from WIND minor frame 1	21	321–341
4–250	Subrecord 3–249 containing TGRS level-zero data from WIND minor frames 2–248	5187	342–5528
251	Subrecord 250 containing TGRS level-zero data from WIND minor frame 249	21	5529–5549
252	Zero (null) fill bytes to pad out to 4-byte word boundary	2	5550–5551
Total record length: 5552 bytes (1388 words)			

The TGRS instrument maneuver mode telemetry subrecord consists of a 21-byte logical subrecord for each minor frame of telemetry. These 21 bytes correspond to the indicated 21 bytes of the GGS WIND maneuver mode telemetry format.

	HK		Sub-com		Fixed-Column Science Allocation										
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Minor Frame Input Byte	17	18	19	20	200	202	204	206	208	210	212	214	216	218	220

	Fixed-Column Science Allocation					
Subrecord Output Byte	15	16	17	18	19	20
Minor Frame Input Byte	222	224	226	228	230	232

Notes:
1. The instrument HK bytes 17 and 18 are allocated to the TGRS instrument in minor frames 8, 18, 28, 38, 48, 58, 68, 78, 88, 98, 108, 118, 128, 138, 148, 158, 168, 178, 188, 198, 208, 218, 228, 238, and 248. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.
2. The subcom (loose) bytes 19 and 20 are allocated to the TGRS instrument in minor frames 0, 8, 18, 20, 28, 38, 40, 48, 58, 60, 68, 78, 80, 88, 98, 108, 118, 128, 138, 148, 158, 168, 178, 188, 198, 208, 218, 228, 238, and 248. The corresponding output bytes (2 and 3) are zero-filled in the remaining subrecords.
3. The listed science allocation bytes are allocated to the TGRS instrument in minor frames 0–249.

3.1.3.2.8 WAVES Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the WIND WAVES instrument.

3.1.3.2.8.1 WAVES Instrument Science and Contingency Science Telemetry Data Record and Subrecord Formats

The WAVES instrument generates 45 bytes of telemetry in each WIND minor frame during WIND science telemetry mode. The following is the format of the level-zero-processed WAVES data record for the WIND science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing WAVES level-zero data from WIND minor frame 0	45	300–344
3	Subrecord 2 containing WAVES level-zero data from WIND minor frame 1	45	345–389
4–250	Subrecord 3–249 containing WAVES level-zero data from WIND minor frames 2–248	11,115	390–11,504
251	Subrecord 250 containing WAVES level-zero data from WIND minor frame 249	45	11,505–11,549
252	Zero (null) fill bytes to pad out to 4-byte word boundary	2	11,550–11,551
Total record length: 11,552 bytes (2888 words)			

The WAVES instrument science or contingency science telemetry format consists of a 45-byte logical subrecord for each minor frame of input telemetry. These 45 bytes correspond to the indicated 45 minor frame bytes of the GGS WIND spacecraft telemetry format.

	HK		Fixed-Column Science Allocation								
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	17	18	24	28	32	36	40	44	48	52	56

	Fixed-Column Science Allocation											
Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20	21	22
Minor Frame Input Byte	60	64	68	72	76	80	84	88	92	96	100	104

	Fixed-Column Science Allocation											
Subrecord Output Byte	23	24	25	26	27	28	29	30	31	32	33	34
Minor Frame Input Byte	108	112	116	120	124	128	132	136	140	144	148	152

	Fixed-Column Science Allocation									
Subrecord Output Byte	35	36	37	38	39	40	41	42	43	44
Minor Frame Input Byte	156	160	164	168	172	176	180	184	188	192

Notes: 1. The instrument HK bytes 17 and 18 are allocated to the WAVES instrument in minor frames 4, 14, 24, 34, 44, 54, 64, 74, 84, 94, 104, 114, 124, 134, 144, 154, 164, 174, 184, 194, 204, 214, 224, 234, and 244. Byte 18 is also allocated to WAVES in minor frames 1, 9, 11, 19, 21, 29, 31, 39, 41, 49, 51, 59, 61, 66, 69, 71, 76, 79, 81, 86, 89, 91, 96, 99, 101, 106, 109, 111, 116, 119, 121, 129, 131, 139, 141, 149, 151, 159, 161, 169, 171, 179, 181, 189, 191, 199, 201, 209, 211, 219, 221, 229, 231, 239, 241, and 249. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The listed science allocation bytes are allocated to the WAVES instrument in minor frames 0–249.

3.1.3.2.8.2 WAVES Instrument Maneuver Mode Data Record and Subrecord Formats

The WAVES instrument generates 61 bytes of telemetry in each WIND minor frame during WIND maneuver mode. The following is the format of the level-zero-processed WAVES data record for the WIND maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing WAVES level-zero data from WIND minor frame 0	61	300–360
3	Subrecord 2 containing WAVES level-zero data from WIND minor frame 1	61	361–421
4–250	Subrecord 3–249 containing WAVES level-zero data from WIND minor frames 2–248	15,067	422–15,488
251	Subrecord 250 containing WAVES level-zero data from WIND minor frame 249	61	14,489–15,549
252	Zero (null) fill bytes to pad out to 4-byte word boundary	2	15,550–15,551
Total record length: 15,552 bytes (3888 words)			

The WAVES instrument maneuver mode telemetry subrecord consists of a 61-byte logical subrecord for each minor frame of telemetry to the indicated 61 bytes of the GGS WIND maneuver mode telemetry format.

	HK		Fixed-Column Science Allocation										
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11	12
Minor Frame Input Byte	17	18	32	33	36	37	40	41	44	45	48	49	52

	Fixed-Column Science Allocation												
Subrecord Output Byte	13	14	15	16	17	18	19	20	21	22	23	24	25
Minor Frame Input Byte	53	56	57	60	61	64	65	68	69	72	73	76	77

	Fixed-Column Science Allocation											
Subrecord Output Byte	26	27	28	29	30	31	32	33	34	35	36	37
Minor Frame Input Byte	80	81	84	85	88	89	92	93	96	97	100	101

	Fixed-Column Science Allocation											
Subrecord Output Byte	38	39	40	41	42	43	44	45	46	47	48	49
Minor Frame Input Byte	104	108	112	116	120	124	128	132	136	140	144	148

	Fixed-Column Science Allocation										
Subrecord Output Byte	50	51	52	53	54	55	56	57	58	59	60
Minor Frame Input Byte	152	156	160	164	168	172	176	180	184	188	192

Notes:

1. The instrument HK bytes 17 and 18 are allocated to the WAVES instrument in minor frames 4, 14, 24, 34, 44, 54, 64, 74, 84, 94, 104, 114, 124, 134, 144, 154, 164, 174, 184, 194, 204, 214, 224, 234, and 244. The HK byte 18 also is allocated to the WAVES instrument in minor frames 1, 9, 11, 19, 21, 29, 31, 39, 41, 49, 51, 59, 61, 66, 69, 71, 76, 79, 81, 86, 89, 91, 96, 99, 101, 106, 109, 111, 116, 119, 121, 129, 131, 139, 141, 149, 151, 159, 161, 169, 171, 179, 181, 189, 191, 199, 201, 209, 211, 219, 221, 229, 231, 239, 241, and 249. The corresponding output bytes (0 and1) are zero-filled in the remaining subrecords.
2. The listed science allocation bytes are allocated to the WAVES instrument in minor frames 0–249.

3.1.3.3 POLAR Spacecraft Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for each instrument onboard the POLAR spacecraft.

Formats are provided for three POLAR spacecraft telemetry modes: science telemetry (usual), contingency science telemetry, and maneuver. The mode is indicated in the DRH. POLAR contingency science telemetry mode is used when a failure contingency occurs that prevents effective use of the spacecraft's despun platform. In this mode, the telemetry bytes that are normally allocated to the instruments on the despun platform are reallocated among the remaining instruments. Note that a switch to this mode is most probably a one-time shot without expectation of returning to the normal science telemetry mode. Refer to Section 3.1.3.2 for a description of maneuver mode.

NRT level-zero data is generated on the CDHF but not distributed to the DDF. The format of the NRT level-zero data is identical to the format of the production level-zero data originating from the GDCF. Because of the NRT system operation, the record size for each instrument's NRT level-zero data is set to the largest record size possible for the instrument. For example, if the production CAMMICE level-zero data record size is 2,800 bytes during science and maneuver telemetry modes and 4,552 bytes during contingency science telemetry mode, the record size for CAMMICE NRT level-zero data is always 4,552 bytes (the larger of the two record sizes). In cases where the NRT record size for the current telemetry mode is less than the maximum, the remaining bytes in the record are zero-filled.

Figure 3–4 depicts the high-level telemetry format for the POLAR spacecraft. The detailed telemetry formats for the POLAR spacecraft are in Reference 9. Note that a major frame contains 250 minor frames (numbered 0–249) of 256 bytes (numbered 0–255) each.

Note: The following subsections specify for each instrument onboard the POLAR spacecraft which telemetry bytes are allocated to the instrument. Identified fixed-column bytes are allocated to the respective instrument in every minor frame. Notes are used to indicate which minor frames contain HK and subcom bytes for the instrument.

In contingency science mode for the POLAR mission, the telemetry allocated to the instruments on the despun platform is reallocated to the remaining instruments in roughly the same proportion as inthe science mode. This mode is restricted in that only whole columns (fixed frame) and no subcom (loose) bytes are allocated.

3.1.3.3.1 CAMMICE Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the POLAR CAMMICE instrument.

Bytes →				Instru-ment HK		Subcom					Fixed Column	Subcom	Fixed Column	
Minor ↓ Frames	0	1	• •	11	12	13	14	15	16	17	• •	38	• •	255
0														
1														
2														
•														
•														
249														

Figure 3–4. POLAR Major Frame Telemetry Format

3.1.3.3.1.1 CAMMICE Instrument Science Telemetry Data Record and Subrecord Formats

The CAMMICE instrument generates 10 bytes of telemetry in each POLAR minor frame during POLAR Science telemetry mode. The following is the format of the level-zero-processed CAMMICE data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing CAMMICE level-zero data from POLAR minor frame 0	10	300–309
3	Subrecord 2 containing CAMMICE level-zero data from POLAR minor frame 1	10	310–319
4–250	Subrecord 3–249 containing CAMMICE level-zero data from POLAR minor frames 2–248	2470	320–2789
251	Subrecord 250 containing CAMMICE level-zero data from POLAR minor frame 249	10	2790–2799
Total record length: 2800 bytes (700 words)			

The CAMMICE instrument science telemetry subrecord format consists of a 10-byte logical subrecord for each minor frame of telemetry. These 10 bytes correspond to the indicated 10 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK		Subcom		Fixed-Column Science Allocation					
	HIT	MICS	MICS/HIT	HIT	MICS			HIT		
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	11	12	15	16	184	185	186	200	201	202

Notes:
1. The instrument HK byte 11 is allocated to the CAMMICE (HIT) instrument in minor frames 8, 56, 68, 80, 92, 116, 128, 140, 152, 164, 176, 188, 200, 212, 224, 236, and 248. The HK byte 12 is allocated to the CAMMICE (MICS) instrument in minor frames 8, 20, 32, 44, 56, 68, 80, 92, 104, 116, 128, 140, 152, 164, 176, 188, 200, 212, 224, 236, and 248. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.
2. The subcom(loose) byte 15 is allocated to the CAMMICE MICS instrument in minor frames 0–60 and CAMMICE HIT instrument in minor frames 61–89. The subcom byte 16 is allocated to CAMMICE HIT in minor frames 210–241. The corresponding output bytes (2 and 3) are zero-filled in the remaining subrecords.
3. The listed science allocation data in bytes 184–186 and 200–202 will be allocated to the CAMMICE instrument in minor frames 0–249. Bytes 184–186 are allocated to MICS data, and bytes 200–202 are allocated to HIT data.

3.1.3.3.1.2 CAMMICE Instrument Contingency Science Telemetry Data Record and Subrecord Formats

The CAMMICE instrument generates 17 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed CAMMICE data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing CAMMICE level-zero data from POLAR minor frame 0	17	300–316
3	Subrecord 2 containing CAMMICE level-zero data from POLAR minor frame 1	17	317–333
4–250	Subrecord 3–249 containing CAMMICE level-zero data from POLAR minor frames 2–248	4199	334–4532
251	Subrecord 250 containing CAMMICE level-zero data from POLAR minor frame 249	17	4533–4549
252	Zero (null) Fill bytes to pad record out to the 4-byte word boundary	2	4550–4551
Total record length: 4552 bytes (1138 words)			

The CAMMICE instrument contingency science telemetry subrecord format consists of a 17-byte logical subrecord is corresponding to the indicated 17 bytes of the GGS POLAR spacecraft contingency science telemetry format.

	HK		Fixed-Column Science Allocation									
	HIT	MICS	MICS								HIT	
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	11	12	25	26	27	45	46	47	65	66	67	85

	Fixed-Column Science Allocation (HIT)				
Subrecord Output Byte	12	13	14	15	16
Minor Frame Input Byte	86	87	105	106	107

Notes:
1. The instrument HK byte 11 is allocated to the CAMMICE (HIT) instrument in minor frames 8, 56, 68, 80, 92, 116, 128, 140, 152, 164, 176, 188, 200, 212, 224, 236, and 248. The instrument HK byte 12 is allocated to the CAMMICE (MICS) instrument in minor frames 8, 20, 32, 44, 56, 68, 80, 92, 104, 116, 128, 140, 152, 164, 176, 188, 200, 212, 224, 236, and 248.
2. The listed science allocation bytes are allocated to the CAMMICE instrument in minor frames 0–249.

3.1.3.3.1.3 CAMMICE Instrument Maneuver Mode Data Record and Subrecord Formats

The CAMMICE instrument generates 10 bytes of telemetry in each POLAR minor frame during POLAR maneuver mode. The following is the format of the level-zero-processed CAMMICE data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing CAMMICE level-zero data from POLAR minor frame 0	10	300–309
3	Subrecord 2 containing CAMMICE level-zero data from POLAR minor frame 1	10	310–319
4–250	Subrecord 3–249 containing CAMMICE level-zero data from POLAR minor frames 2–248	2470	320–2789
251	Subrecord 250 containing CAMMICE level-zero data from POLAR minor frame 249	10	2790–2799
Total record length: 2800 bytes (700 words)			

The CAMMICE instrument maneuver mode telemetry subrecord consists of a 10-byte logical subrecord for each minor frame of telemetry to the indicated 10 bytes of the GGS POLAR maneuver mode telemetry format.

	HK		Subcom		Fixed-Column Science Allocation					
	HIT	MICS	MICS/HIT	HIT	MICS			HIT		
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	11	12	15	16	184	185	186	200	201	202

Notes: 1. The instrument HK byte 11 is allocated to the CAMMICE (HIT) instrument in minor frames 8, 56, 68, 80, 92, 116, 128, 140, 152, 164, 176, 188, 200, 212, 224, 236, and 248. The HK byte 12 is allocated to the CAMMICE (MICS) instrument in minor frames 8, 20, 32, 44, 56, 68, 80, 92, 104, 116, 128, 140, 152, 164, 176, 188, 200, 212, 224, 236, and 248. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The subcom (loose) byte 15 is allocated to the CAMMICE MICS instrument in minor frames 0–60 and CAMMICE HIT instrument in minor frames 61–89. The subcom byte 16 is allocated to CAMMICE HIT in minor frames 210–241. The corresponding output bytes (2 and 3) are zero-filled in the remaining subrecords.

3. The listed science allocation bytes are allocated to the CAMMICE instrument in minor frames 0–249. Bytes 184–186 are allocated to MICS; bytes 200–202 are allocated to HIT.

3.1.3.3.2 CEPPAD Instrument Level-Zero Subrecord Formats

This section presents the level-zero subrecord formats for the POLAR CEPPAD instrument.

3.1.3.3.2.1 CEPPAD Instrument Science Telemetry Data Record and Subrecord Formats

The CEPPAD instrument generates 18 bytes of telemetry in each POLAR minor frame during POLAR Science telemetry mode. The following is the format of the level-zero-processed CEPPAD data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing CEPPAD level-zero data from POLAR minor frame 0	18	300–317
3	Subrecord 2 containing CEPPAD level-zero data from POLAR minor frame 1	18	318–335
4–250	Subrecord 3–249 containing CEPPAD level-zero data from POLAR minor frames 2–248	4446	336–4781
251	Subrecord 250 containing CEPPAD level-zero data from POLAR minor frame 249	18	4782–4799
Total record length: 4800 bytes (1200 words)			

The CEPPAD instrument science telemetry subrecord format consists of a 18-byte logical subrecord for each minor frame of telemetry. These 18 bytes correspond to the indicated 18 minor frame bytes of the GGS POLAR spacecraft science telemetry format.

	HK		Subcom	Fixed-Column Science Allocation						
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	11	12	15	192	193	194	204	205	206	212

	Fixed-Column Science Allocation							
Subrecord Output Byte	10	11	12	13	14	15	16	17
Minor Frame Input Byte	213	214	220	221	222	228	229	230

Notes:
1. The instrument HK bytes 11 and 12 are allocated to the CEPPAD instrument in minor frames 9, 21, 69, 81, 93, 105, 117, 129, 141, 153, 165, 177, 189, 201, 213, 225, 237, and 249. The HK byte 11 also is allocated to the CEPPAD instrument in minor frame 55; HK byte 12 also is allocated to the CEPPAD instrument in minor frames 33, 45, and 57. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.
2. The byte 15 subcom (loose) byte is allocated to the CEPPAD instrument in minor frames 90–249. The corresponding output byte 2 is zero-filled in the remaining subrecords.

3. The listed science allocation bytes are allocated to the CEPPAD instrument in minor frames 0–249.

3.1.3.3.2.2 CEPPAD Instrument Contingency Science Telemetry Data Record and Subrecord Formats

The CEPPAD instrument generates 33 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed CEPPAD data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing CEPPAD level-zero data from POLAR minor frame 0	33	300–332
3	Subrecord 2 containing CEPPAD level-zero data from POLAR minor frame 1	33	333–365
4–250	Subrecord 3–249 containing CEPPAD level-zero data from POLAR minor frames 2–248	8151	366–8516
251	Subrecord 250 containing CEPPAD level-zero data from POLAR minor frame 249	33	8517–8549
252	Zero (null) fill bytes to pad record out to the 4-byte word boundary	2	8550–8551
Total record length: 8552 bytes (2138 words)			

The CEPPAD instrument contingency science telemetry consists of a 33-byte logical subrecord for each minor frame of telemetry. These 33 bytes correspond to the indicated 33 bytes of the GGS POLAR spacecraft contingency science telemetry format.

	HK		Fixed-Column Science Allocation								
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	11	12	125	126	127	145	146	147	165	166	167

	Fixed-Column Science Allocation										
Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20	21
Minor Frame Input Byte	185	186	187	202	203	204	216	217	218	230	231

	Fixed-Column Science Allocation										
Subrecord Output Byte	22	23	24	25	26	27	28	29	30	31	32
Minor Frame Input Byte	232	241	242	243	247	248	249	251	253	254	255

Notes: 1. The instrument HK bytes 11 and 12 are allocated to the CEPPAD instrument in minor frames 9, 21, 69, 81, 93, 105, 117, 129, 141, 153, 165, 177, 189, 201, 213, 225, 237, and 249. The HK byte 11 is allocated to the CEPPAD instrument in minor frame 55; the HK byte 12 is also allocated to the CEPPAD instrument in minor frames 33, 45, and 57. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The listed science allocation bytes are allocated to the CEPPAD instrument in minor frames 90–249.

3.1.3.3.2.3 CEPPAD Maneuver Mode Data Record and Subrecord Formats

The CEPPAD instrument generates 18 bytes of telemetry in each POLAR maneuver mode. The following is the format of the level-zero-processed CEPPAD data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing CEPPAD level-zero data from POLAR minor frame 0	18	300–317
3	Subrecord 2 containing CEPPAD level-zero data from POLAR minor frame 1	18	318–335
4–250	Subrecord 3–249 containing CEPPAD level-zero data from POLAR minor frames 2–248	4446	336–4781
251	Subrecord 250 containing CEPPAD level-zero data from POLAR minor frame 249	18	4782–4799
Total record length: 4800 bytes (1200 words)			

The CEPPAD instrument maneuver mode telemetry subrecord consists of a 18-byte logical subrecord for each minor frame of telemetry to the indicated 18 bytes of the GGS POLAR maneuver mode telemetry format.

	HK		Subcom	Fixed-Column Science Allocation						
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	11	12	15	192	193	194	204	205	206	212

	Fixed-Column Science Allocation							
Subrecord Output Byte	10	11	12	13	14	15	16	17
Minor Frame Input Byte	213	214	220	221	222	228	229	230

Notes: 1. The instrument HK bytes 11 and 12 are allocated to the CEPPAD instrument in minor frames 9, 21, 69, 81, 93, 105, 117, 129, 141, 153, 165, 177, 189, 201, 213, 225, 237, and 249. The HK byte 11 is allocated to the CEPPAD instrument in minor frame

55; the HK byte 12 is also allocated to the CEPPAD instrument in minor frames 33, 45, and 57. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The byte 15 subcom (loose) byte is allocated to the CEPPAD instrument in minor frames 90–249.

3.1.3.3.3 EFI Level-Zero Data Record and Subrecord Formats

This section presents the level-zero subrecord formats for the POLAR EFI instrument.

3.1.3.3.3.1 EFI Science Telemetry Data Record and Subrecord Formats

The Electric Field Experiment (EFI) generates 13 bytes of telemetry in each POLAR minor frame during POLAR Science telemetry mode. The following is the format of the level-zero-processed EFI data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing EFI level-zero data from POLAR minor frame 0	13	300–312
3	Subrecord 2 containing EFI level-zero data from POLAR minor frame 1	13	313–325
4–250	Subrecord 3–249 containing EFI level-zero data from POLAR minor frames 2–248	3211	326–3536
251	Subrecord 250 containing EFI level-zero data from POLAR minor frame 249	13	3537–3549
252	Fill bytes to pad record out to 4-byte word boundary	2	3550–3551
Total record length: 3552 bytes (888 words)			

The EFI science telemetry subrecord format consists of a 13-byte logical subrecord for each minor frame of telemetry. These 13 bytes correspond to the indicated 13 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK	Subcom	Fixed-Column Science Allocation				
Subrecord Output Byte	0	1	2	3	4	5	6
Minor Frame Input Byte	12	14	39	208	209	210	216

	Fixed-Column Science Allocation					
Subrecord Output Byte	7	8	9	10	11	12
Minor Frame Input Byte	217	218	224	225	226	245

Notes: 1. The instrument HK byte 12 is allocated to the EFI in minor frames 2, 4, 14, 16, 26, 28, 38, 40, 50, 52, 62, 64, 74, 76, 86, 88, 98, 100, 110, 112, 122, 124, 134, 136, 146, 148, 158, 160, 170, 172, 182, 184, 194, 196, 206, 208, 218, 220, 230, 232, 242, and 244. The corresponding output byte (0) is zero-filled in the remaining subrecords.

2. The subcom (loose) byte 14 is allocated to the EFI in minor frames 0–124. The corresponding output byte (1) is zero-filled in the remaining subframes.

3. The listed science allocation bytes are allocated to the EFI instrument in minor frames 0–249.

3.1.3.3.3.2 EFI Contingency Science Telemetry Data Record and Subrecord Formats

The EFI generates 25 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed EFI data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing EFI level-zero data from POLAR minor frame 0	25	300–324
3	Subrecord 2 containing EFI level-zero data from POLAR minor frame 1	25	325–349
4–250	Subrecord 3–249 containing EFI level-zero data from POLAR minor frames 2–248	6175	350–6524
251	Subrecord 250 containing EFI level-zero data from POLAR minor frame 249	25	6525–6549
252	Fill bytes to pad record out to the 4-byte word boundary	2	6550–6551
Total record length: 6552 bytes (1638 words)			

The EFI contingency science telemetry subrecord format consists of a 25-byte logical subrecord corresponding to the indicated 25 bytes of the GGS POLAR instrument contingency science telemetry subrecord format.

	HK	Fixed-Column Science Allocation								
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	12	29	30	31	49	50	51	69	70	71

	Fixed-Column Science Allocation										
Subrecord Output Byte	10	11	12	13	14	15	16	17	18	19	20
Minor Frame Input Byte	89	90	91	109	110	111	129	130	131	149	150

	Fixed-Column Science Allocation			
Subrecord Output Byte	21	22	23	24
Minor Frame Input Byte	151	169	170	171

Notes: 1. The instrument HK byte 12 is allocated to the EFI in minor frames 2, 4, 14, 16, 26, 28, 38, 40, 50, 52, 62, 64, 74, 76, 86, 88, 98, 100, 110, 112, 122, 124, 134, 136, 146, 148, 158, 160, 170, 172, 182, 184, 194, 196, 206, 208, 218, 220, 230, 232, 242, and 244. The corresponding output byte (0) is zero-filled in the remaining subrecords.
2. The listed science allocation bytes are allocated to the EFI instrument in minor frames 0–249.

3.1.3.3.3.3 EFI Maneuver Mode Data Record and Subrecord Formats

The EFI instrument generates 13 bytes of telemetry in each POLAR minor frame during POLAR maneuver mode. The following is the format of the level-zero-processed EFI data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing EFI level-zero data from POLAR minor frame 0	13	300–312
3	Subrecord 2 containing EFI level-zero data from POLAR minor frame 1	13	313–325
4–250	Subrecord 3–249 containing EFI level-zero data from POLAR minor frames 2–248	3211	326–3536
251	Subrecord 250 containing EFI level-zero data from POLAR minor frame 249	13	3537–3549
252	Fill bytes to pad record out to 4-byte word boundary	2	3550–3551
Total record length: 3552 bytes (888 words)			

The EFI maneuver mode telemetry subrecord consists of a 13-byte logical subrecord for each minor frame of telemetry to the indicated 13 bytes of the GGS POLAR maneuver mode telemetry format.

	HK	Subcom	Fixed-Column Science Allocation				
Subrecord Output Byte	0	1	2	3	4	5	6
Minor Frame Input Byte	12	14	39	208	209	210	216

	Fixed-Column Science Allocation					
Subrecord Output Byte	7	8	9	10	11	12
Minor Frame Input Byte	217	218	224	225	226	245

Notes:
1. The instrument HK byte 12 is allocated to the EFI in minor frames 2, 4, 14, 16, 26, 28, 38, 40, 50, 52, 62, 64, 74, 76, 86, 88, 98, 100, 110, 112, 122, 124, 134, 136, 146, 148, 158, 160, 170, 172, 182, 184, 194, 196, 206, 208, 218, 220, 230, 232, 242, and 244. The corresponding output byte (0) is zero-filled in the remaining subrecords.
2. The subcom (loose) byte 14 is allocated to the EFI in minor frames 0–124. The corresponding output byte (1) is zero-filled in the remaining subframes.
3. The listed science allocation bytes are allocated to the EFI instrument in minor frames 0–249.

3.1.3.3.4 Fast Plasma Analyzer (HYDRA) Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the POLAR HYDRA instrument.

3.1.3.3.4.1 HYDRA Instrument Science Telemetry Data Record and Subrecord Formats

The HYDRA instrument generates 24 bytes of telemetry in each POLAR minor frame during POLAR Science telemetry mode. The following is the format of the level-zero-processed HYDRA data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header		0–299
2	Subrecord 1 containing HYDRA level-zero data from POLAR minor frame 0	24	300–323
3	Subrecord 2 containing HYDRA level-zero data from POLAR minor frame 1	24	324–347
4–250	Subrecord 3–249 containing HYDRA level-zero data from POLAR minor frames 2–248	5928	348–6275
251	Subrecord 250 containing HYDRA level-zero data from POLAR minor frame 249	24	6276–6299
Total record length: 6300 bytes (1575 words)			

The HYDRA instrument science telemetry subrecord format consists of a 24-byte logical subrecord for each minor frame of telemetry. These 24 bytes correspond to the indicated 24 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK	Subcom	Fixed-Column Science Allocation					
Subrecord Output Byte	0	1	2	3	4	5	6	7
Minor Frame Input Byte	12	17	20	28	36	52	60	68

	Fixed-Column Science Allocation							
Subrecord Output Byte	8	9	10	11	12	13	14	15
Minor Frame Input Byte	76	84	92	100	108	116	124	132

	Fixed-Column Science Allocation							
Subrecord Output Byte	16	17	18	19	20	21	22	23
Minor Frame Input Byte	140	148	156	164	172	180	188	198

Notes:
1. The instrument HK byte 12 is allocated to the HYDRA instrument in minor frames 1, 7, 13, 19, 25, 31, 37, 43, 49, 55, 61, 67, 73, 79, 85, 91, 97, 103, 109, 115, 121, 127, 133, 139, 145, 151, 157, 163, 169, 175, 181, 187, 193, 199, 205, 211, 217, 223, 229, 235, 241, and 247. The corresponding output byte (0) is zero-filled in the remaining subrecords.
2. The subcom (loose) byte 17 is allocated to the HYDRA instrument in minor frames 0–138. The corresponding output byte (1) is zero-filled in the remaining subrecords.
3. The listed science allocation bytes are allocated to the HYDRA instrument in minor frames 0–249

3.1.3.3.4.2 HYDRA Instrument Contingency Science Telemetry Data Record and Subrecord Formats

The HYDRA instrument generates 47 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed HYDRA data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing HYDRA level-zero data from POLAR minor frame 0	47	300–346
3	Subrecord 2 containing HYDRA level-zero data from POLAR minor frame 1	47	347–393
4–250	Subrecord 3–249 containing HYDRA level-zero data from POLAR minor frames 2–248	11,609	394–12002
251	Subrecord 250 containing HYDRA level-zero data from POLAR minor frame 249	47	12,003–12,049
252	Zero (null) fill bytes to pad record out to the 4-byte word boundary	2	12,050–12,051
Total record length: 12,052 bytes (3013 words)			

The HYDRA instrument contingency science telemetry subrecord format consists of a 47-byte logical subrecord corresponding to the indicated 47 bytes of the GGS POLAR instrument contingency science telemetry subrecord format.

	HK	Fixed-Column Science Allocation								
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	12	16	20	24	28	32	36	40	44	48

	Fixed-Column Science Allocation									
Subrecord Output Byte	10	11	12	13	14	15	16	17	18	19
Minor Frame Input Byte	52	56	60	64	68	72	76	80	84	88

	Fixed-Column Science Allocation									
Subrecord Output Byte	20	21	22	23	24	25	26	27	28	29
Minor Frame Input Byte	92	96	100	104	108	112	116	120	124	128

	Fixed-Column Science Allocation									
Subrecord Output Byte	30	31	32	33	34	35	36	37	38	39
Minor Frame Input Byte	132	136	140	144	148	152	156	160	164	168

	Fixed-Column Science Allocation						
Subrecord Output Byte	40	41	42	43	44	45	46
Minor Frame Input Byte	172	176	180	184	188	192	196

Notes: 1. The instrument HK byte 12 of subframes 1, 7, 13, 19, 25, 31, 37, 43, 49, 55, 61, 67, 73, 79, 85, 91, 97, 103, 109, 115, 121, 127, 133, 139, 145, 151, 157, 163, 169, 175, 181, 187, 193, 199, 205, 211, 217, 223, 229, 235, 241, and 247. The corresponding output byte (0) is zero-filled in the remaining subrecords.

2. The listed science allocation bytes are allocated to the HYDRA instrument in minor frames 0–249.

3.1.3.3.4.3 HYDRA Instrument Maneuver Mode Data Record and Subrecord Formats

The HYDRA instrument generates 2 bytes of telemetry in each minor frame during POLAR maneuver mode. The following is the format of the level-zero-processed HYDRA data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing HYDRA level-zero data from POLAR minor frame 0	2	300–301
3	Subrecord 2 containing HYDRA level-zero data from POLAR minor frame 1	2	302–303
4–250	Subrecord 3–249 containing HYDRA level-zero data from POLAR minor frames 2–248	494	304–797
251	Subrecord 250 containing HYDRA level-zero data from POLAR minor frame 249	2	798–799
252	Fill bytes to pad record to 4-byte word boundary	1992	800–2791
Total record length: 2792 bytes (698 words)			

The HYDRA instrument maneuver mode telemetry subrecord consists of a 15-byte logical subrecord for each minor frame of telemetry to the indicated 2 bytes of the GGS POLAR maneuver mode telemetry format.

	HK	Subcom
Subrecord Output Byte	0	1
Minor Frame Input Byte	12	17

Notes:
1. The instrument HK byte 12 is allocated to the HYDRA instrument in minor frames 1, 7, 13, 19, 25, 31, 37, 43, 49, 55, 61, 67, 73, 79, 85, 91, 97, 103, 109, 115, 121, 127, 133, 139, 145, 151, 157, 163, 169, 175, 181, 187, 193, 199, 205, 211, 217, 223, 229, 235, 241, and 247. The corresponding output byte (0) is zero-filled in the remaining subrecords.
2. The subcom (loose) byte 17 is allocated to the HYDRA instrument in minor frames 0–138. The corresponding output byte (1) is zero-filled in the remaining subrecords.

3.1.3.3.5 MFE Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the POLAR MFE instrument.

3.1.3.3.5.1 MFE Instrument Science Telemetry Data Record and Subrecord Formats

The MFE instrument generates 6 bytes of telemetry in each POLAR minor frame during POLAR science telemetry mode. The following is the format of the level-zero-processed MFE data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing MFE level-zero data from POLAR minor frame 0	6	300–305
3	Subrecord 2 containing MFE level-zero data from POLAR minor frame 1	6	306–311
4–250	Subrecord 3–249 containing MFE level-zero data from POLAR minor frames 2–248	1482	312–1793
251	Subrecord 250 containing MFE level-zero data from POLAR minor frame 249	6	1794–1799
252	Zero (null) fill bytes to pad out to minimum record length	992	1800–2791
Total record length: 2792 bytes (698 words)			

The MFE instrument science telemetry subrecord format consists of 6-byte logical subrecord for each minor frame of telemetry. These 6 bytes correspond to the indicated 6 minor frames bytes of the GGS POLAR spacecraft telemetry format.

	HK		Subcom	Fixed-Column Science Allocation		
Subrecord Output Byte	0	1	2	3	4	5
Minor Frame Input Byte	11	12	16	23	37	244

Notes: 1. The instrument HK bytes 11 and 12 are allocated to the MFE instrument in minor frames 3, 15, 63, 75, 87, 99, 111, 123, 135, 147, 159, 171, 183, 195, 207, 219, 231, and 243. The HK byte 12 is also allocated to the MFE instrument in minor frames 27, 39, and 51. The corresponding output byte (0) is zero-filled in the remaining subrecords.

2. The subcom (loose) byte 16 is allocated to the MFE instrument in minor frames 0–209. The corresponding output byte (2) is zero-filled in the remaining subrecords.

3. The listed science allocation bytes are allocated to the MFE instrument in minor frames 0–249.

3.1.3.3.5.2 MFE Instrument Contingency Science Telemetry Data Record and Subrecord Formats

The MFE instrument generates 10 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed MFE data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing MFE level-zero data from POLAR minor frame 0	10	300–309
3	Subrecord 2 containing MFE level-zero data from POLAR minor frame 1	10	310–319
4–250	Subrecord 3–249 containing MFE level-zero data from POLAR minor frames 2–248	2470	320–2789
251	Subrecord 250 containing MFE level-zero data from POLAR minor frame 249	10	2790–2799
Total record length: 2800 bytes (700 words)			

The MFE instrument contingency science telemetry subrecord consists of a 10-byte logical subrecord corresponding to the indicated 10 bytes of the GGS POLAR instrument contingency subrecord format.

	HK		Fixed-Column Science Allocation							
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	11	12	200	201	211	212	222	223	233	234

Notes: 1. The instrument HK bytes 11 and 12 are allocated to the MFE instrument in minor frames 3, 15, 63, 75, 87, 99, 111, 123, 135, 147, 159, 171, 183, 195, 207, 219, 231, and 243. The HK byte 12 is also allocated to the MFE Instrument in minor frames 27, 39, and 51. The corresponding output byte 0 is zero-filled in the remaining subrecords.

2. The listed science allocation bytes are allocated to the MFE instrument in minor frames 0–249.

3.1.3.3.5.3 MFE Instrument Maneuver Mode Data Record and Subrecord Formats

The MFE generates 6 bytes of telemetry in each minor frame during POLAR maneuver mode. The following is the format of the level-zero-processed MFE data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing MFE level-zero data from POLAR minor frame 0	6	300–305
3	Subrecord 2 containing MFE level-zero data from POLAR minor frame 1	6	306–311
4–250	Subrecord 3–249 containing MFE level-zero data from POLAR minor frames 2–248	1482	312–1793

Item	Description	Length (bytes)	Record (bytes)
251	Subrecord 250 containing MFE level-zero data from POLAR minor frame 249	6	1794–1799
252	Zero (null) fill bytes to pad out to minimum record length	992	1800–2791
Total record length: 2792 bytes (698 words)			

The MFE instrument maneuver mode telemetry subrecord consists of a 6-byte logical subrecord for each minor frame of telemetry to the indicated 6 bytes of the GGS POLAR maneuver mode telemetry format.

	HK		Subcom	Fixed-Column Science Allocation		
Subrecord Output Byte	0	1	2	3	4	5
Minor Frame Input Byte	11	12	16	23	37	244

Notes: 1. The instrument HK bytes 11 and 12 are allocated to the MFE instrument in minor frames 3, 15, 63, 75, 87, 99, 111, 123, 135, 147, 159, 171, 183, 195, 207, 219, 231, and 243. The HK byte 12 is also allocated to the MFE Instrument in minor frames 27, 39, and 51. The corresponding output byte (0) is zero-filled in the remaining subrecords.

2. The subcom (loose) byte 16 is allocated to the MFE instrument in minor frames 0–209. The corresponding output byte (2) is zero-filled in the remaining subrecords.

3. The listed science allocation bytes are allocated to the MFE instrument in minor frames 0–249.

3.1.3.3.6 PIXIE Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the POLAR PIXIE instrument.

3.1.3.3.6.1 PIXIE Instrument Science Telemetry Data Record and Subrecord Formats

The PIXIE instrument generates 17 bytes of telemetry in each POLAR minor frame during POLAR science telemetry mode. The 17 bytes are moved into a 24-byte subrecord that also contains SEPS data. The following is the format of the level-zero-processed PIXIE data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing PIXIE level-zero data from POLAR minor frame 0	24	300–323

Item	Description	Length (bytes)	Record (bytes)
3	Subrecord 2 containing PIXIE level-zero data from POLAR minor frame 1	24	324–347
4–250	Subrecord 3–249 containing PIXIE level-zero data from POLAR minor frames 2–248	5928	348–6275
251	Subrecord 250 containing PIXIE level-zero data from POLAR minor frame 249	24	6276–6299
Total record length: 6300 bytes (1575 words)			

The science telemetry subrecord format for PIXIE and SEPS consists of a 24-byte logical subrecord for each minor frame of telemetry. These 24 bytes correspond to the indicated 24 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK		Subcom	Fixed-Column Science Allocation	Subcom	Fixed-Column Science Allocation					
	PIX/SEPS	SEPS	SEPS	SEPS	PIX	SEPS		PIX			
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	11	12	17	19	38	40	41	42	43	44	93

	Fixed-Column Science Allocation												
	PIX											SEPS	
Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20	21	22	23
Minor Frame Input Byte	94	95	144	145	146	195	196	197	246	247	248	249	250

Notes:
1. PIXIE and SEPS share this format. The science allocation minor frame bytes 41, 42, 43, 92, 93, 94, 143, 144, 194, 195, 196, 245, 246, and 247 are normally allocated to PIXIE. But, when PIXIE's high voltage is turned off to protect the instrument, these bytes are allocated to SEPS.
2. The instrument HK byte 11 is allocated to the PIXIE instrument in minor frames 1, 4, 7, 10, 13, 16, 19, 20, 22, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 38, 39, 41, 42, 44, 45, 47, 48, 49, 51, 54, 67, 73, 101, and 104. Byte 11 is allocated to SEPS in minor frames 31, 34, 46, 58, 70, 82, 94, 106, 118, 130, 142, 154, 166, 178, 190, 202, 214, 226, and 238. Byte 12 is allocated to SEPS in minor frames 10, 22, 34, 46, 58, 70, 82, 94, 106, 118, 130, 142, 154, 166, 178, 190, 202, 214, 226, and 238. The corresponding output byte (0) is zero-filled in the remaining subrecords.
3. The subcom (loose) byte 17 is allocated to the SEPS instrument in minor frames 139–249. The corresponding output byte (2) is zero-filled in the remaining subrecords.
4. The subcom (loose) byte 38 is allocated to the PIXIE instrument in minor frames 0, 2, 3, 5, 6, 8, 9, 11, 12, 14, 15, 17, 18, 21, 25, 28, 31, 34, 37, 40, 43, 46, 50, 52, 53,

55–100, 102, 103, and 105–249. The corresponding output byte (4) is zero-filled in the remaining subrecords.

5. The listed science allocation bytes are allocated to the PIXIE/SEPS in minor frames 0–249.

3.1.3.3.6.2 PIXIE Instrument Contingency Science Telemetry Data Records and Subrecord Formats

The PIXIE instrument generates 2 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed PIXIE data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing PIXIE level-zero data from POLAR minor frame 0	2	300–301
3	Subrecord 2 containing PIXIE level-zero data from POLAR minor frame 1	2	302–303
4–250	Subrecord 3–249 containing PIXIE level-zero data from POLAR minor frames 2–248	494	304–797
251	Subrecord 250 containing PIXIE level-zero data from POLAR minor frame 249	2	798–799
252	Zero (null) fill bytes to pad record out to minimum record length	1992	800–2791
Total record length: 2792 bytes (698 words)			

The PIXIE instrument contingency science telemetry subrecord consists of a 2-byte logical subrecord corresponding to the indicated 2 bytes of the POLAR instrument contingency science telemetry format.

	HK	
	PIX/SEPS	SEPS
Subrecord Output Byte	0	1
Minor Frame Input Byte	11	12

Notes: 1. In contingency mode the PIXIE instrument receives only housekeeping data. In this mode, PIXIE has no fixed column allocations.

2. The instrument HK byte 11 is allocated to the PIXIE instrument in minor frames 1, 4, 7, 10, 13, 16, 19, 20, 22, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 38, 39, 41, 42, 44, 45, 47, 48, 49, 51, 54, 67, 73, 101, and 104. Byte 11 is allocated to SEPS in minor frames 31, 34, 46, 58, 70, 82, 94, 106, 118, 130, 142, 154, 166, 178, 190, 202, 214, 226, and 238. The corresponding output byte (0) is zero-filled in the remaining subrecords.

3. Byte 12 is allocated to SEPs in minor frames 10, 22, 34, 46, 58, 70, 82, 94, 106, 118, 130, 142, 154, 166, 178, 190, 202, 214, 226, and 238. The corresponding output byte (0) is zero-filled in the remaining subrecords.

3.1.3.3.6.3 PIXIE Instrument Maneuver Mode Data Record and Subrecord Formats

The PIXIE instrument generates 5 bytes of telemetry in each minor frame during POLAR maneuver mode. The 5 bytes are moved into an 11-byte subrecord that also contains SEPS data. The following is the format of the level-zero-processed PIXIE data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing PIXIE level-zero data from POLAR minor frame 0	11	300–310
3	Subrecord 2 containing PIXIE level-zero data from POLAR minor frame 1	11	311–321
4–250	Subrecord 3–249 containing PIXIE level-zero data from POLAR minor frames 2–248	2717	322–3038
251	Subrecord 250 containing PIXIE level-zero data from POLAR minor frame 249	11	3039–3049
252	Zero fill bytes to pad record out to 4-byte word boundary	2	3050–3051
Total record length: 3052 bytes (763 words)			

The PIXIE instrument maneuver mode telemetry subrecord consists of an 11-byte logical subrecord for each minor frame of telemetry to the indicated 11 bytes of the GGS POLAR maneuver mode telemetry format.

	HK		Subcom	Fixed-Column Science Allocation	Subcom	Fixed-Column Science Allocation	
	PIX/SEPS	SEPS	SEPS	SEPS	PIX	SEPS	
Subrecord Output Byte	0	1	2	3	4	5	6
Minor Frame Input Byte	11	12	17	19	38	40	41

	Fixed-Column Science Allocation			
	PIX			SEPS
Subrecord Output Byte	7	8	9	10
Minor Frame Input Byte	144	195	246	249

Notes: 1. PIXIE and SEPS share this format. The fixed column bytes 144, 195, and 246 are normally allocated to PIXIE. But when PIXIE's high voltage is turned off to protect the instrument, these bytes are allocated to SEPS.

2. The instrument HK byte 11 is allocated to the PIXIE instrument in minor frames 1, 4, 7, 10, 13, 16, 19, 20, 22, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 38, 39, 41, 42, 44, 45, 47, 48, 49, 51, 54, 67, 73, 101, and 104. Byte 11 is allocated to SEPS in minor frames 31, 34, 46, 58, 70, 82, 94, 106, 118, 130, 142, 154, 166, 178, 190, 202, 214, 226, and 238. The corresponding output byte (0) is zero-filled in the remaining subrecords.
3. Byte 12 is allocated to SEPS in minor frames 10, 22, 34, 46, 58, 70, 82, 94, 106, 118, 130, 142, 154, 166, 178, 190, 202, 214, 226, 238. The corresponding output byte (1) is zero-filled in the remaining subrecord.
4. The subcom (loose) byte 17 is allocated to SEPS in minor frames 139–249. The output byte 2 will be zero-filled in the remaining subrecords.
5. The subcom (loose) byte 38 is allocated to the PIXIE instrument in minor frames 0, 2, 3, 5, 6, 8, 9, 11, 12, 14, 15, 17, 18, 21, 25, 28, 31, 34, 37, 40, 43, 46, 50, 52, 53, 55–100, 102, 103, and 105–249. The corresponding output byte (4) is zero-filled in the remaining subrecords.
6. The listed science allocation bytes are allocated to the PIXIE/SEPS in major frames 0–249.

3.1.3.3.7 PWI Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the POLAR PWI instrument.

3.1.3.3.7.1 PWI Science Telemetry Data Record and Subrecord Formats

The PWI generates 21 bytes of telemetry in each POLAR minor frame during POLAR science telemetry mode. The following is the format of the level-zero-processed PWI record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing PWI level-zero data from POLAR minor frame 0	21	300–320
3	Subrecord 2 containing PWI level-zero data from POLAR minor frame 1	21	321–341
4–250	Subrecord 3–249 containing PWI level-zero data from POLAR minor frames 2–248	5187	342–5528
251	Subrecord 250 containing PWI level-zero data from POLAR minor frame 249	21	5529–5549
252	Fill bytes to pad record out to 4-byte word boundary	2	5550–5551
Total record length: 5552 bytes (1388 words)			

The PWI subrecord format consists of a 21-byte logical subrecord for each minor frame of telemetry. These 21 bytes correspond to the indicated 21 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK		Sub-com	Fixed-Column Science Allocation								
	Low Rate	Low and High Rate	High Rate	High Rate			Low Rate			High Rate		
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	11	12	14	64	65	66	88	89	90	112	113	114

	Fixed-Column Science Allocation								
	Low Rate			High Rate		Low Rate			
Subrecord Output Byte	12	13	14	15	16	17	18	19	20
Minor Frame Input Byte	136	137	138	168	169	170	232	233	234

Notes:
1. The instrument HK byte 11 is allocated to the PWI instrument (low rate) in minor frame 0. HK byte 12 is allocated to the PWI low rate data in minor frames 0, 24, 48, 71, 72, 95, 96, 119, 120, 143, 144, 167, 168, 191, 192, 215, and 216. HK byte 12 is allocated to PWI high rate data in minor frames 11, 12, 36, 59, 60, 83, 84, 107, 108, 131, 132, 155, 156, 179, 180, 203, 204, 227, and 228. The corresponding bytes (0 and 1) in the remaining subrecords will be zero-filled. Note: In addition, output byte 1 in subrecords 247 and 248 will be filled from input byte 9 in minor frames 247 and 248, respectively.
2. The subcom (loose) byte 14 is allocated to PWI (high rate) in minor frames 142–249. The corresponding output byte (2) is zero-filled in the minor frames 0–141.
3. The science allocation low rate data is in bytes 88, 89, 90, 136, 137, 138, 170, 232, 233, and 234. The science allocation high rate data will be in bytes 64, 65, 66, 112, 113, 114, 168, and 169.
4. The listed science allocation bytes are allocated to the PWI instrument in minor frames 0–249.

3.1.3.3.7.2 PWI Contingency Science Telemetry Data Record and Subrecord Formats

The PWI generates 42 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed PWI data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing PWI level-zero data from POLAR minor frame 0	42	300–341

Item	Description	Length (bytes)	Record (bytes)
3	Subrecord 2 containing PWI level-zero data from POLAR minor frame 1	42	342–383
4–250	Subrecord 3–249 containing PWI level-zero data from POLAR minor frames 2–248	10,374	384–10,757
251	Subrecord 250 containing PWI level-zero data from POLAR minor frame 249	42	10,758–10,799
Total record length: 10,800 bytes (2700 words)			

The PWI contingency science telemetry subrecord format consists of a 42-byte subrecord corresponding to the indicated 42 bytes of the GGS POLAR instrument contingency science telemetry subrecord format.

	HK		Fixed-Column Science Allocation						
	Low Rate	Low and High Rate	High Rate						
Subrecord Output Byte	0	1	2	3	4	5	6	7	8
Minor Frame Input Byte	11	12	13	14	15	33	34	35	53

	Fixed-Column Science Allocation								
	High Rate					Low Rate			High Rate
Subrecord Output Byte	9	10	11	12	13	14	15	16	17
Minor Frame Input Byte	54	55	73	74	75	93	94	95	113

	Fixed-Column Science Allocation								
	High Rate		Low Rate			High Rate			
Subrecord Output Byte	18	19	20	21	22	23	24	25	26
Minor Frame Input Byte	114	115	133	134	135	153	154	155	173

	Fixed-Column Science Allocation								
	High Rate								
Subrecord Output Byte	27	28	29	30	31	32	33	34	35
Minor Frame Input Byte	174	175	189	190	191	205	206	207	219

	Fixed-Column Science Allocation					
	High Rate		Low Rate			
Subrecord Output Byte	36	37	38	39	40	41
Minor Frame Input Byte	220	221	235	236	237	250

Notes:
1. The instrument HK byte 11 is allocated to the PWI (low rate) in minor frame 0. HK byte 12 is allocated to the PWI low rate data in minor frames 0, 24, 48, 71, 72, 95, 96, 119, 120, 143, 144, 167, 168, 191, 192, 215, 216, 239, and 240. HK byte 12 is allocated to PWI high rate data in minor frames 11, 12, 36, 59, 60, 83, 84, 107, 108, 131, 132, 155, 156, 179, 180, 203, 204, 227, and 228. The corresponding bytes (0 and 1) in the remaining subrecords will be zero-filled.
2. The science allocation low rate data is in bytes 93–95, 133–135, 235–237, and 250. The science allocation high rate data is in bytes 13–15, 33–35, 53–55, 73–75, 113–115, 153–155, 173–175, 189–191, 205–207, and 219–221.
3. The listed science allocation bytes are allocated to the PWI instrument in minor frames 0–249.

3.1.3.3.7.3 PWI Maneuver Mode Data Record and Subrecord Formats

The PWI instrument generates 21 bytes of telemetry in each minor frame during POLAR maneuver mode. The following is the format of the level-zero-processed PWI data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing PWI level-zero data from POLAR minor frame 0	21	300–320
3	Subrecord 2 containing PWI level-zero data from POLAR minor frame 1	21	321–341
4–250	Subrecord 3–249 containing PWI level-zero data from POLAR minor frames 2–248	5187	342–5528
251	Subrecord 250 containing PWI level-zero data from POLAR minor frame 249	21	5529–5549
252	Fill bytes to pad record out to 4-byte word boundary	2	5550–5551
Total record length: 5552 bytes (1388 words)			

The PWI maneuver mode telemetry subrecord consists of a 21-byte logical subrecord for each minor frame of telemetry to the indicated 21 bytes of the GGS POLAR maneuver mode telemetry format.

	HK		Subcom	Fixed-Column Science Allocation								
	Low Rate	Low and High Rate	High Rate	High Rate			Low Rate			High Rate		
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	11	12	14	64	65	66	88	89	90	112	113	114

	Fixed-Column Science Allocation								
	Low Rate			High Rate		Low Rate			
Subrecord Output Byte	12	13	14	15	16	17	18	19	20
Minor Frame Input Byte	136	137	138	168	169	170	232	233	234

Notes: 1. The instrument HK byte 11 is allocated to the PWI (low rate) in minor frame 0. HK byte 12 is allocated to the PWI low rate data in minor frames 0, 24, 48, 71, 72, 95, 96, 119, 120, 143, 144, 167, 168, 191, 192, 215, 216, 239, and 240. HK byte 12 is allocated to PWI high rate data in minor frames 11, 12, 36, 59, 60, 83, 84, 107, 108, 131, 132, 155, 156, 179, 180, 203, 204, 227, and 228. The corresponding bytes (0 and 1) in the remaining subrecords will be zero-filled.

2. The subcom (loose) byte 14 is allocated to the PWI and contains high rate data in minor frames 142–249. The corresponding output byte (2) is zero-filled in the minor frames 0–141.
3. The science allocation low rate data is in bytes 88–90, 136–138, 170, and 232–234. The science allocation high rate data will be in bytes 64–66, 112–114, 168, and 169.
4. The listed science allocation bytes are allocated to the PWI instrument in minor frames 0–249.

3.1.3.3.8 SEPS Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the POLAR SEPS instrument.

3.1.3.3.8.1 SEPS Instrument Science Telemetry Data Record and Subrecord Formats

The SEPS instrument generates 8 bytes of telemetry in each POLAR minor frame during POLAR science telemetry mode. The 8 bytes are moved into a 24-byte subrecord that also contains PIXIE data. The following is the format of the level-zero-processed SEPS data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing SEPS level-zero data from POLAR minor frame 0	24	300–323
3	Subrecord 2 containing SEPS level-zero data from POLAR minor frame 1	24	324–347

Item	Description	Length (bytes)	Record (bytes)
4–250	Subrecord 3–249 containing SEPS level-zero data from POLAR minor frames 2–248	5928	348–6275
251	Subrecord 250 containing SEPS level-zero data from POLAR minor frame 249	24	6276–6299
Total record length: 6300 bytes (1575 words)			

The SEPS instrument science telemetry subrecord format consists of a 24-byte logical subrecord for each minor frame of telemetry. The 24 bytes correspond to the indicated 24 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK		Subcom	Fixed Column	Subcom	Fixed-Column Science Allocation					
	PIX/ SEPS	SEPS	SEPS	SEPS	PIX	SEPS		PIX			
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	11	12	17	19	38	40	41	42	43	44	93

	Fixed-Column Science Allocation												
	PIX											SEPS	
Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20	21	22	23
Minor Frame Input Byte	94	95	144	145	146	195	196	197	246	247	248	249	250

Notes:
1. The PIXIE and SEPS instruments share this format. SEPS is always allocated bytes 19, 40, 41, 249, and 250. It also allocated bytes 42, 43, 44, 93, 94, 144, 145, 195, 196, 197, 246, 247, and 248 when PIXIE's high voltage is turned off to protect the instrument.
2. The instrument HK bytes 11 and 12 are allocated to the SEPS instrument in minor frames 34, 46, 58, 70, 82, 94, 106, 118, 130, 142, 154, 166, 178, 190, 202, 214, 226, and 238. HK byte 12 is also allocated to the SEPS instrument in minor frames 10 and 22. HK byte 11 is also allocated to SEPS in minor frame 31. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords with the following exception. Byte 11 is allocated to PIXIE in minor frames 1, 4, 7, 10, 13, 16, 19, 20, 22, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 38, 39, 41, 42, 44, 45, 47, 48, 49, 51, 54, 67, 73, 101, and 104.
3. The subcom (loose) byte 17 is allocated to the SEPS instrument in minor frames 139–249. The corresponding output byte (2) is zero-filled in the remaining subrecords.
4. Byte 38 is allocated to PIXIE minor frames 0, 2, 3, 5, 6, 8,. 9, 11, 12, 14, 15, 17, 18, 21, 25, 28, 31, 34, 37, 40, 43, 46, 50, 52, 53, 55–100, 102, 103, and 105–249.
5. The listed science allocation bytes are allocated to the PIXIE/SEPS instruments in minor frames 0–249.

3.1.3.3.8.2 SEPS Instrument Contingency Science Telemetry Data Record and Subrecord Formats

The SEPS instrument generates 2 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed SEPS data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing SEPS level-zero data from POLAR minor frame 0	2	300–301
3	Subrecord 2 containing SEPS level-zero data from POLAR minor frame 1	2	302–303
4–250	Subrecord 3–249 containing SEPS level-zero data from POLAR minor frames 2–248	494	304–797
251	Subrecord 250 containing SEPS level-zero data from POLAR minor frame 249	2	798–799
252	Zero (null) fill bytes to pad record out to the minimum record length	1992	800–2791
Total record length: 2792 bytes (698 words)			

The SEPS instrument contingency science telemetry subrecord format consists of a 2-byte subrecord corresponding to the indicated 2 bytes of the GGS POLAR instrument contingency science telemetry subrecord format.

	HK	
Subrecord Output Byte	0	1
Minor Frame Input Byte	11	12

Notes: 1. In contingency mode, the SEPS instrument receives only housekeeping data.
2. The instrument HK byte 11 is allocated to the PIXIE instrument in minor frames 1, 4, 7, 10, 13, 16, 19, 20, 22, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 38, 39, 41, 42, 44, 45, 47, 48, 49, 51, 54, 67, 73, 101, and 104. Byte 11 is allocated to SEPS in minor frames 31, 34, 46, 58, 70, 82, 94, 106, 118, 130, 142, 154, 166, 178, 190, 202, 214, 226, and 238. The corresponding output byte (0) is zero-filled in the remaining subrecords.

3.1.3.3.8.3 SEPS Instrument Maneuver Mode Data Record and Subrecord Formats

The SEPS instrument generates 7 bytes of telemetry in each minor frame during POLAR maneuver mode. These 7 bytes are moved into an 11-byte subrecord shared with PIXIE. The following is the format of the level-zero-processed SEPS data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing SEPS level-zero data from POLAR minor frame 0	11	300–310
3	Subrecord 2 containing SEPS level-zero data from POLAR minor frame 1	11	311–321
4–250	Subrecord 3–249 containing SEPS level-zero data from POLAR minor frames 2–248	2717	322–3038
251	Subrecord 250 containing SEPS level-zero data from POLAR minor frame 249	11	3039–3049
252	Zero (null) fill bytes to pad record out to 4-byte word boundary	2	3050–3051
Total record length: 3052 bytes (763 words)			

The SEPS instrument maneuver mode telemetry subrecord consists of an 11-byte logical subrecord for each minor frame of telemetry to the indicated 11 bytes of the GGS POLAR maneuver mode telemetry format.

	HK		Subcom	Fixed-Column Science Alloca-tion	Subcom	Fixed-Column Science Allocation	
	PIX/SEPS	SEPS	SEPS	SEPS	PIX	SEPS	
Subrecord Output Byte	0	1	2	3	4	5	6
Minor Frame Input Byte	11	12	17	19	38	40	41

	Fixed-Column Science Allocation			
	PIX			SEPS
Subrecord Output Byte	7	8	9	10
Minor Frame Input Byte	144	195	246	249

Notes: 1. The PIXIE and SEPS instruments share this format. SEPS is always allocated bytes 19, 40, 41, and 249. It also is allocated bytes 42, 43, 44, 144, 195, and 246, when PIXIE's high voltage is turned off to protect the instrument.

2. The instrument HK bytes 11 and 12 are allocated to the SEPS instrument in minor frames 34, 46, 58, 70, 82, 94, 106, 118, 130, 142, 154, 166, 177, 190, 202, 214, 226, and 238. HK byte 12 is also allocated to the SEPS instrument in minor frames 10 and 22. HK byte 11 is also allocated to SEPS minor frame 31. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords with the following exception. Byte 11 is allocated to PIXIE in minor frames 1, 4, 7, 10, 13, 16, 19, 20,

22, 24, 26, 27, 29, 30, 32, 33, 35, 36, 38, 39, 41, 42, 44, 45, 47, 48, 49, 51, 54, 56, 67, 73, 101, and 104.

3. The subcom (loose) byte 17 is allocated to the SEPS instrument in minor frames 140–250. The corresponding output byte (2) is zero-filled in the remaining subrecords.
4. The listed science allocation bytes are allocated to the PIXIE/SEPS instruments in minor frames 0–249.

3.1.3.3.9 TIDE Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data records and subrecord formats for the POLAR TIDE instrument.

3.1.3.3.9.1 TIDE Instrument Science Telemetry Data Record and Subrecord Formats

The TIDE instrument generates 22 bytes of telemetry in each POLAR minor frame during POLAR science telemetry mode. The following is the format of the level-zero-processed TIDE data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing TIDE level-zero data from POLAR minor frame 0	22	300–321
3	Subrecord 2 containing TIDE level-zero data from POLAR minor frame 1	22	322–343
4–250	Subrecord 3–249 containing TIDE level-zero data from POLAR minor frames 2–248	5434	344–5777
251	Subrecord 250 containing TIDE level-zero data from POLAR minor frame 249	22	5778–5799
Total record length: 5800 bytes (1450 words)			

The TIDE instrument science telemetry subrecord format consists of a 22-byte logical subrecord for each minor frame of telemetry. These 22 bytes correspond to the indicated 22 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK			Subcom	Fixed-Column Science Allocation			
Subrecord Output Byte	0	1	2	3	4	5	6	7
Minor Frame Input Byte	10	11	12	13	48	49	50	72

	Fixed-Column Science Allocation							
Subrecord Output Byte	8	9	10	11	12	13	14	15
Minor Frame Input Byte	73	74	96	97	98	120	121	122

	Fixed-Column Science Allocation					
Subrecord Output Byte	16	17	18	19	20	21
Minor Frame Input Byte	152	153	154	176	177	178

Notes:
1. The spacecraft HK byte 10 is allocated to the TIDE instrument in minor frames 7, 8, 57, 58, 107, 108, 157, 158, 207, and 208. The corresponding output byte (0) is zero-filled in the remaining subrecords.
2. The instrument HK bytes 11 and 12 are allocated to the TIDE instrument in minor frames 5, 17, 53, 65, 77, 89, 113, 125, 137, 149 161, 173, 185, 197, 209, 221, 233, and 245. HK byte 11 is also allocated to the TIDE instrument in minor frames 61, 79, 85, 91, 97, 103, and 134. HK byte 12 is also allocated to the TIDE instrument in minor frames 29, 41, and 101. The corresponding output bytes (1 and 2) are zero-filled in the remaining subrecords.
3. The subcom (loose) byte 13 is allocated to the TIDE instrument in minor frames 142–249. The corresponding output byte (3) is zero-filled in the remaining subrecords.
4. The listed science allocation bytes are allocated to the TIDE instrument in minor frames 0–249.

3.1.3.3.9.2 TIDE Instrument Contingency Science Telemetry Data Record and Subrecord Formats

The TIDE instrument generates 43 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed TIDE data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing TIDE level-zero data from POLAR minor frame 0	43	300–342
3	Subrecord 2 containing TIDE level-zero data from POLAR minor frame 1	43	343–385
4–250	Subrecord 3–249 containing TIDE level-zero data from POLAR minor frames 2–248	10,621	386–11,006
251	Subrecord 250 containing TIDE level-zero data from POLAR minor frame 249	43	11,007–11,049
252	Zero (null) fill bytes to pad record out to 4-byte word boundary	2	11,050–11,051
Total record length: 11,052 bytes (2763 words)			

The TIDE instrument contingency science telemetry subrecord format consists of a 43-byte logical subrecord corresponding to the indicated 43 bytes of the GGS POLAR instrument contingency subrecord format.

	HK			Fixed-Column Science Allocation						
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	10	11	12	17	18	19	37	38	39	57

	Fixed-Column Science Allocation									
Subrecord Output Byte	10	11	12	13	14	15	16	17	18	19
Minor Frame Input Byte	58	59	77	78	79	97	98	99	117	118

	Fixed-Column Science Allocation										
Subrecord Output Byte	20	21	22	23	24	25	26	27	28	29	30
Minor Frame Input Byte	119	137	138	139	157	158	159	177	178	179	193

	Fixed-Column Science Allocation											
Subrecord Output Byte	31	32	33	34	35	36	37	38	39	40	41	42
Minor Frame Input Byte	194	195	208	209	210	224	225	226	238	239	240	252

Notes:
1. The spacecraft HK byte 10 is allocated to the TIDE instrument in minor frames 7, 8, 57, 58, 107, 108, 207, and 208. The corresponding output byte (0) is zero-filled in the remaining subrecords
2. The instrument HK bytes 11 and 12 are allocated to the TIDE instrument in minor frames 5, 17, 53, 65, 77, 89, 113, 125, 137, 149, 161, 173, 185, 197, 209, 221, 233, and 245. HK byte 11 is also allocated to the TIDE instrument in minor frames 61, 79, 85, 91, 97, 103, and 134. HK byte 12 is also allocated to the TIDE instrument in minor frames 29, 41, and 101. The corresponding output bytes (1 and 2) are zero-filled in the remaining subrecords.
3. The listed science allocation bytes are allocated to the TIDE instrument in minor frames 0–249.

3.1.3.3.9.3 TIDE Instrument Maneuver Mode Data Record and Subrecord Formats

The TIDE instrument generates 22 bytes of telemetry in each minor frame during POLAR maneuver mode. The following is the format of the level-zero-processed TIDE data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing TIDE level-zero data from POLAR minor frame 0	22	300–321
3	Subrecord 2 containing TIDE level-zero data from POLAR minor frame 1	22	322–343

4–250	Subrecord 3–249 containing TIDE level-zero data from POLAR minor frames 2–248	5434	344–5777
251	Subrecord 250 containing TIDE level-zero data from POLAR minor frame 249	22	5778–5799
Total record length: 5800 bytes (1450 words)			

The TIDE instrument maneuver mode telemetry subrecord consists of a 22-byte logical subrecord for each minor frame of telemetry to the indicated 22 bytes of the GGS POLAR maneuver mode telemetry format.

	HK			Subcom	Fixed-Column Science Allocation			
Subrecord Output Byte	0	1	2	3	4	5	6	7
Minor Frame Input Byte	10	11	12	13	48	49	50	72

	Fixed-Column Science Allocation							
Subrecord Output Byte	8	9	10	11	12	13	14	15
Minor Frame Input Byte	73	74	96	97	98	120	121	122

	Fixed-Column Science Allocation					
Subrecord Output Byte	16	17	18	19	20	21
Minor Frame Input Byte	152	153	154	176	177	178

Notes:
1. The instrument HK byte 10 is allocated to the TIDE instrument in minor frames 7, 8, 57, 58, 107, 108, 157, 158, 207, and 208. The corresponding output byte 0 is zero-filled in the remaining subrecords.
2. The instrument HK bytes 11 and 12 are allocated to the TIDE instrument in minor frames 5, 17, 53, 65, 77, 89, 113, 125, 137, 149, 161, 173, 185, 197, 209, 221, 233, and 245. HK byte 11 is also allocated to the TIDE instrument in minor frames 61, 79, 85, 91, 97, 103, and 134. HK byte 12 is also allocated to the TIDE instrument in minor frames 29, 41, and 101. The corresponding output bytes (1 and 2) are zero-filled in the remaining subrecords.
3. The subcom (loose) byte 13 is allocated to the TIDE instrument in minor frames 142–249. The corresponding output byte (3) is zero-filled in the remaining subrecords.
4. The listed science allocation bytes are allocated to the TIDE instrument in minor frames 0–249.

3.1.3.3.10 TIMAS Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for POLAR TIMAS instrument.

3.1.3.3.10.1 TIMAS Instrument Science Telemetry Data Record and Subrecord Formats

The TIMAS instrument generates 21 bytes of telemetry in each POLAR minor frame during POLAR science telemetry mode. The following is the format of the level-zero-processed TIMAS data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing TIMAS level-zero data from POLAR minor frame 0	21	300–320
3	Subrecord 2 containing TIMAS level-zero data from POLAR minor frame 1	21	332–341
4–250	Subrecord 3–249 containing TIMAS level-zero data from POLAR minor frames 2–248	5187	342–5528
251	Subrecord 250 containing TIMAS level-zero data from POLAR minor frame 249	21	5529–5549
252	Fill bytes to pad record out to 4-byte word boundary	2	5550–5551
Total record length: 5552 bytes (1388 words)			

The TIMAS instrument science telemetry subrecord format consists of a 21-byte logical subrecord for each minor frame of telemetry. These 21 bytes correspond to the indicated 21 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK		Fixed-Column Science Allocation								
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	11	12	21	31	32	33	56	57	58	80	81

	Fixed-Column Science Allocation									
Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20
Minor Frame Input Byte	82	104	105	106	128	129	130	160	161	162

Notes: 1. The instrument HK bytes 11 and 12 are allocated to the TIMAS instrument in minor frames 6, 18, 66, 78, 90, 102, 114, 126, 138, 150, 162, 174, 186, 198, 210, 222, 234, and 246. HK byte 11 is allocated to the TIMAS instrument in minor frames 109, 115, 121, 127, and 133. HK byte 12 is allocated to TIMAS in minor frames 30, 42, and 54. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The listed science allocation bytes are allocated to the TIMAS instrument in minor frames 0–249.

3.1.3.3.10.2 TIMAS Instrument Contingency Science Telemetry Data Record and Subrecord Formats

The TIMAS instrument generates 41 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed TIMAS data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing TIMAS level-zero data from POLAR minor frame 0	41	300–340
3	Subrecord 2 containing TIMAS level-zero data from POLAR minor frame 1	41	341–381
4–250	Subrecord 3–249 containing TIMAS level-zero data from POLAR minor frames 2–248	10,127	382–10,508
251	Subrecord 250 containing TIMAS level-zero data from POLAR minor frame 249	41	10,509–10,549
252	Fill bytes to pad record out to 4-byte word boundary	2	10,550–10,551
Total record length: 10,552 bytes (2638 words)			

The TIMAS instrument contingency science telemetry subrecord format consists of a 41-byte logical subrecord corresponding to the indicated 41 bytes of the GGS POLAR spacecraft contingency telemetry format.

	HK		Fixed-Column Science Allocation							
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	11	12	21	22	23	41	42	43	61	62

	Fixed-Column Science Allocation									
Subrecord Output Byte	11	11	12	13	14	15	16	17	18	19
Minor Frame Input Byte	63	81	82	83	101	102	103	121	122	123

	Fixed-Column Science Allocation									
Subrecord Output Byte	20	21	22	23	24	25	26	27	28	29
Minor Frame Input Byte	141	142	143	161	162	163	181	182	183	197

	Fixed-Column Science Allocation										
Subrecord Output Byte	30	31	32	33	34	35	36	37	38	39	40
Minor Frame Input Byte	198	199	213	214	215	227	228	229	244	245	246

Notes: 1. The instrument HK bytes 11 and 12 are allocated to the TIMAS instrument in minor frames 6, 18, 66, 78, 90, 102, 114, 126, 138, 150, 162, 174, 186, 198, 210, 222, 234, and 246. HK byte 11 also is allocated to the TIMAS instruments in minor frames 109, 115, 121, 127, and 133. HK byte 12 also is allocated to the TIMAS instrument in minor frames 30, 42, and 54. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The listed science allocation bytes are allocated to the TIMAS instrument in minor frames 0–249.

3.1.3.3.10.3 TIMAS Instrument Maneuver Mode Data Record and Subrecord Formats

The TIMAS instrument generates 21 bytes of telemetry in each minor frame during POLAR maneuver mode. The following is the format of the level-zero-processed TIMAS data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing TIMAS level-zero data from POLAR minor frame 0	21	300–320
3	Subrecord 2 containing TIMAS level-zero data from POLAR minor frame 1	21	321–341
4–250	Subrecord 3–249 containing TIMAS level-zero data from POLAR minor frames 2–248	5187	342–5528
251	Subrecord 250 containing TIMAS level-zero data from POLAR minor frame 249	21	5529–5549
252	Fill bytes to pad record out to 4-byte word boundary	2	5550–5551
Total record length: 5552 bytes (1388 words)			

The TIMAS instrument maneuver mode telemetry subrecord consists of a 21-byte logical subrecord for each minor frame of telemetry to the indicated 21 bytes of the GGS POLAR maneuver mode telemetry format.

	HK		Fixed-Column Science Allocation								
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	11	12	21	30	32	33	56	57	58	80	81

	Fixed-Column Science Allocation									
Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20
Minor Frame Input Byte	82	104	105	106	128	129	130	160	161	162

Notes: 1. The instrument HK bytes 11 and 12 are allocated to the TIMAS instrument in minor frames 6, 18, 66, 78, 90, 102, 114, 126, 138, 150, 162, 174, 186, 198, 210, 222, 234, and 246. HK byte 11 is allocated to the TIMAS instrument in minor frames 109, 115, 121, 127, and 133. HK byte 12 also is allocated to the TIMAS instrument in minor frames 30, 42, and 54. The corresponding output bytes (0 and 1) are zero-filled in the remaining subrecords.

2. The listed science allocation bytes are allocated to the TIMAS instrument in minor frames 0–249.

3.1.3.3.11 UVI Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the POLAR UVI instrument.

3.1.3.3.11.1 UVI Instrument Science Telemetry Data Record and Subrecord Formats

The UVI instrument generates 58 bytes of telemetry in each POLAR minor frame during POLAR science telemetry mode. The following is the format of the level-zero-processed UVI data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing UVI level-zero data from POLAR minor frame 0	58	300–357
3	Subrecord 2 containing UVI level-zero data from POLAR minor frame 1	58	358–415
4–250	Subrecord 3–249 containing UVI level-zero data from POLAR minor frames 2–248	14,326	416–14,741
251	Subrecord 250 containing UVI level-zero data from POLAR minor frame 249	58	14,742–14,799
Total record length: 14,800 bytes (3700 words)			

The UVI instrument science telemetry subrecord format consists of a 58-byte logical subrecord for each minor frame of telemetry. These 58 bytes correspond to the indicated 56 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK	Subcom		Fixed-Column Science Allocation						
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	11	14	38	18	22	26	30	34	47	51

	Fixed-Column Science Allocation									
Subrecord Output Byte	10	11	12	13	14	15	16	17	18	19
Minor Frame Input Byte	55	59	63	67	71	75	79	83	87	91

	Fixed-Column Science Allocation									
Subrecord Output Byte	20	21	22	23	24	25	26	27	28	29
Minor Frame Input Byte	99	103	107	111	115	119	123	127	131	135

	Fixed-Column Science Allocation									
Subrecord Output Byte	30	31	32	33	34	35	36	37	38	39
Minor Frame Input Byte	139	143	147	151	155	159	163	167	171	175

	Fixed-Column Science Allocation									
Subrecord Output Byte	40	41	42	43	44	45	46	47	48	49
Minor Frame Input Byte	179	183	187	191	199	203	207	211	215	219

	Fixed-Column Science Allocation							
Subrecord Output Byte	50	51	52	53	54	55	56	57
Minor Frame Input Byte	223	227	231	235	239	243	251	255

Notes:
1. The instrument HK byte 11 is allocated to the UVI instrument in minor frames 2, 14, 28, 37, 40, 43, 50, 52, 57, 62, 64, 74, 76, 86, 88, 98, 100, 110, 112, 122, 124, 146, 148, 158, 160, 170, 172, 182, 184, 194, 196, 206, 208, 218, 220, 230, 232, 242, and 244. The corresponding output byte (0) is zero-filled in the remaining subrecords.
2. The subcom (loose) byte 14 is allocated to the UVI instrument in minor frames 125–141. The corresponding output byte 1 will be zero-filled in the remaining subrecords.
3. The subcom (loose) byte (38) is allocated to the UVI instrument in minor frames 1, 4, 7, 10, 13, 16, 19, 20, 22, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 38, 39, 41, 42, 44, 45, 47, 48, 49, 51, 54, 101, and 104. The corresponding output byte is zero-filled in the remaining subrecords.
4. The listed science allocation bytes are allocated to the UVI instrument in minor frames 0–249.

3.1.3.3.11.2 UVI Instrument Contingency Science Telemetry Data Record and Subrecord Formats

The UVI instrument generates 1 byte of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed UVI data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing UVI level-zero data from POLAR minor frame 0	1	300
3	Subrecord 2 containing UVI level-zero data from POLAR minor frame 1	1	301
4–250	Subrecord 3–249 containing UVI level-zero data from POLAR minor frames 2–248	247	302–548

Item	Description	Length (bytes)	Record (bytes)
251	Subrecord 250 containing UVI level-zero data from POLAR minor frame 249	1	549
252	Fill bytes to pad record out to the minimum record length	2242	550–2791
Total record length: 2792 bytes (698 words)			

The UVI instrument contingency science telemetry subrecord format consists of a 1-byte logical subrecord corresponding to the following byte of the GGS POLAR instrument contingency subrecord format.

	HK
Subrecord Output Byte	0
Minor Frame Input Byte	11

Notes: 1. The instrument HK byte 11 is allocated to the UVI instrument in minor frames 2, 14, 28, 37, 40, 43, 50, 52, 57, 62, 64, 74, 76, 86, 88, 98, 100, 110, 112, 122, 124, 146, 148, 158, 160, 170, 172, 182, 184, 194, 196, 206, 208, 218, 220, 230, 232, 242, and 244. The corresponding output byte 0 is zero-filled in the remaining subrecords.
2. UVI does not have a fixed column allocation during contingency science mode.

3.1.3.3.11.3 UVI Instrument Maneuver Mode Data Record and Subrecord Formats

The UVI instrument generates 49 bytes of telemetry in each minor frame during POLAR maneuver mode. The following is the format of the level-zero-processed UVI data record during POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing UVI level-zero data from POLAR minor frame 0	49	300–348
3	Subrecord 2 containing UVI level-zero data from POLAR minor frame 1	49	349–397
4–250	Subrecord 3–249 containing UVI level-zero data from POLAR minor frames 2–248	12,103	398–12,500
251	Subrecord 250 containing UVI level-zero data from POLAR minor frame 249	49	12,501–12,549
252	Fill bytes to pad record out to 4-byte word boundary	2	12,550–12,551
Total record length: 12,552 bytes (3138 words)			

The UVI instrument maneuver mode telemetry subrecord consists of a 49-byte logical subrecord for each minor frame of telemetry. These 49 bytes correspond to the indicated 49 bytes of the GGS POLAR maneuver mode telemetry format.

	HK	Subcom		Fixed-Column Science Allocation						
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	11	14	38	18	22	26	47	51	55	59

	Fixed-Column Science Allocation									
Subrecord Output Byte	10	11	12	13	14	15	16	17	18	19
Minor Frame Input Byte	67	71	75	79	83	87	91	99	103	107

	Fixed-Column Science Allocation									
Subrecord Output Byte	20	21	22	23	24	25	26	27	28	29
Minor Frame Input Byte	111	115	119	123	131	135	139	143	147	151

	Fixed-Column Science Allocation									
Subrecord Output Byte	30	31	32	33	34	35	36	37	38	39
Minor Frame Input Byte	155	163	167	171	175	179	183	187	199	203

	Fixed-Column Science Allocation								
Subrecord Output Byte	40	41	42	43	44	45	46	47	48
Minor Frame Input Byte	207	211	215	219	227	231	235	239	243

Notes:
1. The instrument HK byte 11 is allocated to the UVI instrument in minor frames 2, 14, 28, 37, 40, 43, 50, 52, 57, 62, 64, 74, 76, 86, 88, 98, 100, 110, 112, 122, 124, 146, 148, 158, 160, 170, 172, 182, 184, 194, 196, 206, 208, 218, 220, 228, 230, 232, 242, and 244. The corresponding output byte (0) is zero-filled in the remaining subrecords.
2. The subcom (loose) byte 14 is allocated to the UVI instrument in minor frames 125–141. The corresponding output byte 1 will be zero-filled in the remaining subrecords.
3. The subcom (loose) byte (38) is allocated to the UVI instrument in minor frames 1, 4, 7, 10, 13, 16, 19, 20, 22, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 38, 39, 41, 42, 44, 45, 47, 48, 49, 51, 54, 101, and 104. The corresponding output byte 2 is zero-filled in the remaining subrecords.
4. The listed science allocation bytes are allocated to the UVI instrument in minor frames 0–249.

3.1.3.3.12 VIS Instrument Level-Zero Data Record and Subrecord Formats

This section presents the level-zero data record and subrecord formats for the POLAR VIS instrument.

3.1.3.3.12.1 VIS Instrument Science Telemetry Data Record and Subrecord Formats

The VIS instrument generates 54 bytes of telemetry in each POLAR minor frame during POLAR science telemetry mode. The following is the format of the level-zero-processed VIS data record for the POLAR science telemetry mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing VIS level-zero data from POLAR minor frame 0	54	300–353
3	Subrecord 2 containing VIS level-zero data from POLAR minor frame 1	54	354–407
4–250	Subrecord 3–249 containing VIS level-zero data from POLAR minor frames 2–248	13,338	408–13,745
251	Subrecord 250 containing VIS level-zero data from POLAR minor frame 249	54	13,746–13,799
Total record length: 13,800 bytes (3450 words)			

The VIS instrument science telemetry subrecord format consists of a 54-byte logical subrecord for each minor frame of telemetry. These 54 bytes correspond to the indicated 54 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	HK		Subcom		Fixed-Column Science Allocation						
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	11	12	13	16	24	25	27	29	35	45	46

	Fixed-Column Science Allocation									
Subrecord Output Byte	11	12	13	14	15	16	17	18	19	20
Minor Frame Input Byte	53	54	61	62	69	70	77	78	85	86

	Fixed-Column Science Allocation									
Subrecord Output Byte	21	22	23	24	25	26	27	28	29	30
Minor Frame Input Byte	101	102	109	110	117	118	125	126	133	134

	Fixed-Column Science Allocation									
Subrecord Output Byte	31	32	33	34	35	36	37	38	39	40
Minor Frame Input Byte	141	142	149	150	157	158	165	166	173	174

	Fixed-Column Science Allocation									
Subrecord Output Byte	41	42	43	44	45	46	47	48	49	50
Minor Frame Input Byte	181	182	189	190	236	237	238	240	241	242

	Fixed-Column Science Allocation		
Subrecord Output Byte	51	52	53
Minor Frame Input Byte	252	253	254

Notes: 1. The instrument HK byte 11 is allocated to the VIS instrument in minor frames 11, 12, 25, 59, 60, 71, 72, 83, 84, 95, 96, 107, 108, 119, 120, 131, 132, 143, 144, 155, 156, 167, 168, 179, 180, 191, 192, 203, 204, 215, 216, 227, 228, 239, and 240. The HK byte 12 is allocated to the VIS instrument in minor frames 23, 35, and 47. The corresponding output bytes (0 and 1) will be zero-filled in the remaining records.
2. The subcom byte 13 is allocated to the VIS instrument in minor frames 0–141. The corresponding output byte 1 will be zero-filled in minor frames 142–249. The subcom (loose) byte 16 is allocated to the VIS instrument in minor frames 242–249. The corresponding output bytes (2 and 3) will be zero-filled in the remaining subrecords.
3. The listed science allocation bytes are allocated to the VIS instruments in minor frames 0–249.

3.1.3.3.12.2 VIS Instrument Contingency Science Telemetry Data Record and Subrecord Formats

The VIS instrument generates 2 bytes of telemetry in each POLAR minor frame during POLAR contingency mode. The following is the format of the level-zero-processed VIS data record for the POLAR contingency mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing UVI level-zero data from POLAR minor frame 0	2	300–301
3	Subrecord 2 containing UVI level-zero data from POLAR minor frame 1	2	302–303
4–250	Subrecord 3–249 containing UVI level-zero data from POLAR minor frames 2–248	494	304–797
251	Subrecord 250 containing UVI level-zero data from POLAR minor frame 249	2	798–799
252	Fill bytes to pad record out to 4-byte word boundary	1992	800–2791
Total record length: 2792 bytes (698 words)			

The VIS instrument contingency science telemetry subrecord consists of a 2-byte logical subrecord corresponding to the indicated bytes of the GGS POLAR instrument contingency subrecord format.

	HK	
Subrecord Output Byte	0	1
Minor Frame Input Byte	11	12

Notes: 1. The instrument HK byte 11 is allocated to the VIS instrument in minor frames 11, 12, 25, 59, 60, 71, 72, 83, 84, 95, 96, 107, 108, 119, 120, 131, 132, 143, 144, 155, 156, 167, 168, 179, 180, 191, 192, 203, 204, 215, 216, 227, 228, 239, and 240. HK byte 12 is allocated to the VIS instrument in minor frames 23, 35, and 47.

2. VIS does not have a fixed column allocation during contingency science mode.

3.1.3.3.12.3 VIS Instrument Maneuver Mode Data Record and Subrecord Format

The VIS instrument generates 55 bytes of telemetry in each minor frame during POLAR maneuver mode. The following is the format of the level-zero-processed VIS data record for the POLAR maneuver mode.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing VIS level-zero data from POLAR minor frame 0	55	300–354
3	Subrecord 2 containing VIS level-zero data from POLAR minor frame 1	55	355–409
4–250	Subrecord 3–249 containing VIS level-zero data from POLAR minor frames 2–248	13,585	410–13,994
251	Subrecord 250 containing VIS level-zero data from POLAR minor frame 249	55	13,995–14,049
252	Fill bytes to pad record out to 4-byte word boundary	2	14,050–14,051
Total record length: 14,052 bytes (3513 words)			

The VIS instrument maneuver mode telemetry subrecord consists of a 55-byte logical subrecord for each minor frame of telemetry to the indicated 55 bytes of the GGS POLAR maneuver mode telemetry format.

	HK		Subcom		Fixed-Column Science Allocation					
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9
Minor Frame Input Byte	11	12	13	16	27	29	53	54	62	69

	Fixed-Column Science Allocation								
Subrecord Output Byte	10	11	12	13	14	15	16	17	18
Minor Frame Input Byte	70	77	78	85	86	92	93	94	101

	Fixed-Column Science Allocation								
Subrecord Output Byte	19	20	21	22	23	24	25	26	27
Minor Frame Input Byte	102	109	110	117	118	124	125	126	133

	Fixed-Column Science Allocation								
Subrecord Output Byte	28	29	30	31	32	33	34	35	36
Minor Frame Input Byte	134	141	142	149	150	156	157	158	165

	Fixed-Column Science Allocation								
Subrecord Output Byte	37	38	39	40	41	42	43	44	45
Minor Frame Input Byte	166	172	173	174	181	182	188	189	190

	Fixed-Column Science Allocation								
Subrecord Output Byte	46	47	48	49	50	51	52	53	54
Minor Frame Input Byte	236	237	238	240	241	242	252	253	254

Notes:
1. The instrument HK byte 11 is allocated to the VIS instrument in minor frames 11, 12, 25, 59, 60, 71, 72, 83, 84, 95, 96, 107, 108, 119, 120, 131, 132, 143, 144, 155, 156, 167, 168, 179, 180, 191, 192, 203, 204, 215, 216, 227, 228, 239, and 240. The HK byte 12 is allocated to VIS in minor frames 23, 35, and 47. The corresponding output bytes (0 and 1) will be zero-filled in the remaining subrecords.
2. The subcom (loose) byte 13 is allocated to the VIS instrument in minor frames 0–141. The corresponding output byte 1 will be zero-filled in subrecords 142–249. The subcom (loose) byte 16 is allocated to the VIS instrument in minor frames 242–249. The corresponding output byte 2 will be zero-filled in the subrecords.
3, The listed science allocation bytes are allocated to the VIS instrument in minor frames 0–249.

3.2 Q/A File Formats

The Q/A file contains quality and accounting statistics for each major frame used to produce the instrument files. The Q/A file consists of a blank record for CDHF to insert an ISTP data header (which contains SFDU labels and keyword identifying information), a file label record, and a variable number of data records, each containing Q/A entries for up to 200 major frames. Each record contains 8040 bytes. Table 3–3 depicts the Q/A file label record. Table 3–4 depicts the Q/A Data Record format, and Table 3–5 provides a detailed breakdown of the 40-byte Major Frame Q/A entry within the data record.

Table 3–3. Q/A Label Record Definition

Field	Bytes	Name	Comments
1	0–3	Spacecraft ID	
2	4–7	File ID	'Q/A'
3	8–11	Number of Q/A data records	
4	12–27	File process time	
5	28–39	Time of first major frame	
6	40–51	Time of last major frame	
7	52–55	Production indicator	'PROD'/'Q/L'
8	56–59	Decom sequence number	
9	60–63	Total number of major frames	
10	64–67	Total number of data gaps	
11	68–71	Total number of perfect major frames	
12	72–75	Total number of error-free major frames	
13	76–79	Total number of major frames with errors	
14	80–83	Experiment file flags	Note 1
15	84–8039	Spares	

Note: Experiment flags are set to indicate which experiments the operator requested for inclusion in this set.

The following items describe the Q/A Label Record Fields.

Field Name: **Spacecraft ID**
Type/Length: Integer/4
Value(s): 24 = GEOTAIL
25 = WIND
26 = POLAR
Description: This field identifies the satellite that transmitted the data contained in the associated level-zero files.

Field Name: **File ID**
Type/Length: Character/4
Value(s): 'Q/A'
Description: This field identifies the type of data contained in this Decom Q/A file.

Field Name: **Number of Q/A Data Records**
Type/Length: Integer/4

Description:	This field identifies the number of physical Q/A data records contained in this Decom Q/A file.
Field Name:	**File Process Time**
Type/Length:	Character/16
Description:	This field identifies the wall clock time (GMT) that this Decom Q/A file was created. The time is in the following format: YYYYDDDHHMMSSUUU, where YYYY = 4-digit year identifier DDD = 3-digit day of year HH = 2-digit hour of day MM = 2-digit minute of hour SS = 2-digit second of minute UUU = 3-digit millisecond of second
Field Name:	**Time of First Major Frame**—File Start Time
Type/Length:	Integer/12
Description:	This field identifies the first major frame in the Decom Q/A file and has the following format: 16-bit binary year, 16-bit binary day count, 32-bit binary millisecond of day, and 32-bit microseconds. Note: microsecond of day = microseconds + 1000* millisecond of day.
Field Name:	**Time of Last Major Frame**—File End Time
Type/Length:	Integer/12
Description:	This field identifies the ATC of the last major frame in the Decom Q/A file and has the following format: 16-bit binary year, 16-bit binary day count, 32-bit binary millisecond of day, and 32-bit microseconds. Note: microsecond of day = microseconds + 1000* millisecond of day.
Field Name:	**Production Indicator**
Type/Length:	Character/4
Value(s):	'PROD' or 'Q/L'
Description:	This identifies the type of production run requested; production (PROD) or quicklook (Q/L).
Field Name:	**Decom Sequence Number**
Type/Length:	Integer/4
Value(s):	Starts at 0 and increments by 1 each Decom rerun.
Description:	This field identifies the decom sequence number associated with the level-zero files.
Field Name:	**Total Number of Major Frames**
Type/Length:	Integer/4
Description:	This field identifies the total number of major frames contained in the associated level-zero files.

Field Name: **Total Number of Data Gaps**
Type/Length: Integer/4
Description: This field identifies the number of places in the Decom Q/A file that have a gap of one or more consecutive major frames.

Field Name: **Total Number of Perfect Major Frames**
Type/Length: Integer/4
Description: This field identifies the total number of major frames that contain neither minor frames with errors nor fill minor frames in the associated level-zero files.

Field Name: **Total Number of Error-Free Major Frames**
Type/Length: Integer/4
Description: This field identifies the total number of major frames that contain no minor frames with frame sync errors or major or minor frame counter errors in the associated level-zero files. They will, however, contain fill minor frames.

Field Name: **Total Number of Major Frames With Errors**
Type/Length: Integer/4
Description: This field identifies the total number of major frames containing at least one minor frame with a minor and/or a major frame counter error and/or a frame sync error in the associated level-zero file. They may, however, also contain fill minor frames.

Field Name: **Experiment File Flags**
Type/Length: Integer/4
Description: This field identifies the experiments that were requested for processing by the Decom subsystem.

Field Name: **Spares**
Type/Length: Character/7956
Description: This field identifies the spare bytes that fill out the remainder of the Decom Q/A label record. The spare bytes are zero (null)-filled.

Table 3–4. Q/A Data Record Format (1 of 2)

Field	Bytes	Name	Comments
1	0–3	Record count	
2	4–7	Number of major frame Q/A entries	1–200
3	8–11	Count of Q/A entries with data gap flag set	
4	12–15	Count of perfect major frame Q/A entries	

Table 3–4. Q/A Data Record Format (2 of 2)

Field	Bytes	Name	Comments
5	16–39	Spares	
6	40–79	Major frame Q/A entry 1	
205	8000–8039	Major frame Q/A entry 200	

Table 3–5. Major Frame Q/A Entry Format

Field	Bytes	Name	Comments
1	0–1	Time: year	
2	2–3	Time: day of year	
3	4–7	Time: milliseconds of day	
4	8–11	Time: microseconds of milliseconds	
5	12–13	ATC correction flag	
6	14–15	Data gap flag	
7	16–17	Spare	
8	18–19	Telemetry mode	
9	20–23	Major frame counter	
10	24–27	Number of fill minor frames	
11	28–31	Number of minor frame counter errors	
12	32–35	Number of frame sync pattern errors	
13	36–39	Number of minor frame counter jumps	

Note: The data gap flag is set to indicate a data gap of one or more major frames precedes the major frame corresponding to this entry.

Field Name: **Record Count**

Type/Length: Integer/4

Description: The relative position of this physical Q/A data record from within the Q/A file.

Field Name: **Number of Major Frame Q/A Entries in This Record**

Type/Length: Integer/4

Description: The number of the logical decom Q/A entries contained in this data record. The maximum number is 200.

Field Name: **Count of Q/A Entries With the Data Gap Flag Set**
Type/Length: Integer/4
Description: The number of Q/A entries contained in this data record that have the data gap flag set.

Field Name: **Count of Perfect Major Frame Q/A Entries**
Type/Length: Integer/4
Description: The number of Q/A entries contained in this data record that have perfect major frames.

Field Name: **Spares**
Type/Length: Character/24
Description: This field contains zero (null)-filled spare bytes.

The following 13 fields constitute one logical Decom Q/A entry. There may be 200 of these logical Decom Q/A entries within each physical Q/A data record. A logical Decom Q/A entry spans 40 bytes.

Field Name: **Time: Year of the Major Frame**
Type/Length: Integer/2 (16 bits)
Description: The corrected year for the absolute time code associated with this Q/A data entry.

Field Name: **Time: Day of Year**
Type/Length: Integer/2 (16 bits)
Description: The corrected day for the absolute time code associated with this Q/A data entry.

Field Name: **Time: Milliseconds of Day**
Type/Length: Integer/4
Description: The corrected millisecond of day for the absolute time code associated with this Q/A data entry.

Field Name: **Time: Microseconds**
Type/Length: Integer/4
Description: The corrected microseconds for the absolute time code associated with this Q/A data entry. (Note that microseconds of day = microseconds + 1000* milliseconds of day.)

Field Name: **ATC Correction Flag**
Type/Length: Integer/2
Description: This field is used to indicate whether the ATC time was corrected. A value of one indicates that correction occurred and a value of zero indicates that correction did not occur.

Field Name: **Data Gap Flag**
Type/Length: Integer/2 (16 bits)
Description: This field is used to indicate a data gap of one or more major frames precedes this Q/A data entry. A value of one indicates a data gap has occurred and a value of zero indicates that a data gap did not occur.

Field Name: **Spare**
Type/Length: Integer/2 (16 bits)
Description: This field contains zero (null)-filled spare bytes.

Field Name: **Telemetry Mode Indicator**
Type/Length: Integer/2 (16 bits)
Description: This field indicates the spacecraft's mode during the major frame.

Field Name: **Major Frame Counter**
Type/Length: Integer/4
Description: This field specifies the major frame counter value for the major frame associated with this Q/A data entry.

Field Name: **Number of Fill Minor Frames**
Type/Length: Integer/4
Description: The number of minor frames contained in the major frame for this Q/A data entry that were zero-filled by the edit process.

Field Name: **Number of Minor Frame Counter Errors**
Type/Length: Integer/4
Description: The number of minor frames contained in the major frame for the Q/A data entry that have minor frame counter errors.

Field Name: **Number of Frame Sync Pattern Errors**
Type/Length: Integer/4
Description: The number of minor frames within the major frame for this Q/A data entry that have frame sync pattern errors.

Field Name: **Number of Minor Counter Jumps**
Type/Length: Integer/4
Description: The number of minor frames contained in the major frame for the Q/A data entry that have minor frame counter jumps.

3.3 Housekeeping Data Format

Spacecraft housekeeping data is level-zero data that provides health and safety information about the spacecraft. A housekeeping data file contains the housekeeping data for one spacecraft (GEOTAIL, WIND, or POLAR) for a given day (midnight-to-midnight GMT).

Figure 3–5 shows the format of the housekeeping data file. Each spacecraft housekeeping data file contains an FLR and a variable number of data records, each containing a DRH followed by one major frame's worth of housekeeping data. Physical record size is fixed within a given spacecraft file but varies across spacecraft, depending on the number of housekeeping words in a telemetry major frame. The minimum physical record size is 2792 bytes, the minimum size of an FLR. The maximum physical record size is 32 kB.

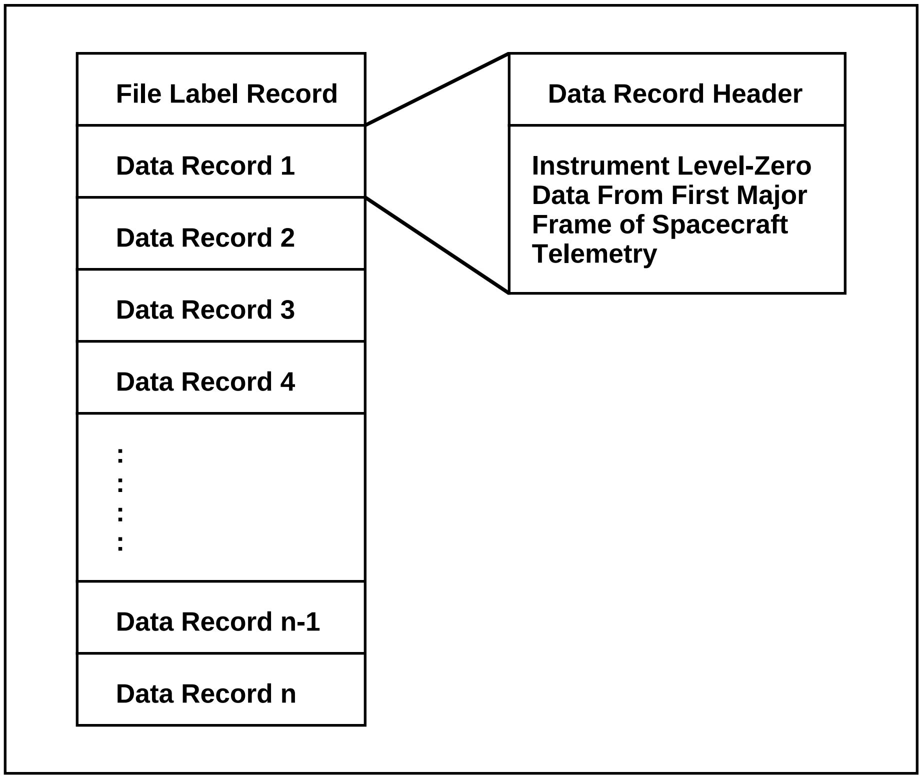


Figure 3–5. Housekeeping Data File Format

The actual record size for a specific spacecraft housekeeping file is determined by the number of housekeeping bytes generated by the spacecraft in a telemetry major frame plus the DRH. If this value is less than the minimum FLR size (2792 bytes), the physical record size is fixed at 2792 bytes, and the data records are zero filled out to this length. If the major frame bytes plus DRH size is greater than 32 kB, the logical record must be subdivided into multiple physical records that conform to the 2792-byte-to-32-kB rule. Note that none of the spacecraft (GEOTAIL, WIND, or POLAR) generate so much housekeeping data that such subdivision of the logical records is necessary.

The number of data records varies with the period covered by the data. A production housekeeping file spans a 24-hour, midnight-to-midnight GMT period. A quicklook housekeeping file spans the first hour's worth of telemetry received during a GEOTAIL contact.

This section presents the formats of the housekeeping data file FLR, DRH, and subrecords.

3.3.1 Housekeeping Data File Label Record

An FLR is the first spacecraft housekeeping file record. The FLR occupies a minimum of 2792 bytes. Table 3–1 defines each FLR field. The associated material in Section 3.1.1.2 describes each FLR field. Note that the FLR for housekeeping data files is identical to the FLR for level-zero data files.

3.3.2 Housekeeping Data Subrecord Formats

Each data record in a housekeeping data file begins with a DRH. Note that the minor frame quality field (last field) consists of one byte of quality flags for each minor frame. This section defines and describes the DRH. Table 3–2 and its associated descriptive material define and describe each DRH field. The DRH for a housekeeping data file is identical to the DRH for a level-zero data file.

3.3.3 Housekeeping Data Record and Subrecord Formats

The data (nonheader) part of each level-zero-processed data record for a given instrument is subdivided into fixed-length subrecords, each containing that instrument's instrument data and instrument housekeeping data from a minor, sometimes called sub, frame. The length of the subrecord depends on the number of minor frame bytes allocated to spacecraft housekeeping.

The total length of the housekeeping record in bytes is the number of spacecraft housekeeping bytes per subrecord times the number of minor frames per major frame plus the DRH length plus any additional bytes needed to pad the record to the 4-byte word boundary. As indicated in Section 3.3, the minimum data record size is 2792 bytes, the minimum size of an FLR. Note that for WIND/POLAR instruments, the DRH is 300 bytes long and there are 250 minor frames per major frame. For GEOTAIL, the DRH is 560 bytes long and there are 512 minor frames per major frame.

A zero-filled (null) subrecord is put in the output data record when the associated input minor frame is missing or cannot be interpreted. The DRH contains 1 byte of quality flags for each minor frame (subrecord). One quality flag indicates whether the associated subrecord is filled with zeros. Other quality flags denote frame counter and frame synchronization errors. The statistical information in the Q/A file record associated with a major frame also indicates which minor frames (subrecords) are zero-filled.

The ISTP GDPS never outputs an entire major frame of zero fill. Thus, if the entire major frame is missing from the input or is uninterpretable, the result will be a time gap in the output. The Q/A file indicates which major frames are missing. A missing major frame also can be determined by comparing the major frame count in the DRH of the previous data record to that of the current data record. The frame count increases monotonically from one record to the next when there is no gap between them.

Each housekeeping subrecord is presented as a horizontal table containing Subrecord Output Byte 0 through the last byte in the subrecord. Multiple rows are used as necessary. Immediately below each row of Subrecord Output Bytes is a row depicting the corresponding minor frame input byte that is the data source for the output byte. Commentary notes are used when necessary to describe an unusual circumstance.

As applicable, multiple formats are shown for spacecraft to depict normal mode and maneuver mode formats.

NRT housekeeping data for WIND and POLAR is generated on the CDHF, but not distributed to the DDF. The format of the NRT housekeeping data is identical to the format of the production housekeeping data originating from the GDCF. Because of the NRT system operation, the record size for each mission's NRT housekeeping data is set to the largest record size possible for the mission. For example, if the production WIND housekeeping data record size is 4,052 bytes during science telemetry mode and 17,300 bytes during maneuver telemetry mode, the record size for WIND NRT housekeeping data is always 17,300 bytes (the larger of the two record sizes). In cases where the NRT record size for the current telemetry mode is less than the maximum, the remaining bytes in the record are zero-filled.

The formats of the housekeeping data subrecords for the GEOTAIL, WIND, and POLAR spacecraft are presented in the following subsections.

3.3.3.1 GEOTAIL Spacecraft Housekeeping Data Record and Subrecord Formats

This section presents the housekeeping data records and subrecord formats for the GEOTAIL spacecraft. The GEOTAIL spacecraft generates 11 bytes of housekeeping telemetry in each GEOTAIL minor frame during the GEOTAIL record observation (normal) and contingency modes. The following is the format of the level-zero-processed housekeeping data record for the GEOTAIL record observation and contingency modes.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	560	0–559
2	Subrecord 1 containing spacecraft housekeeping data from GEOTAIL minor frame 0	11	560–570
3	Subrecord 2 containing spacecraft housekeeping data from GEOTAIL minor frame 1	11	571–581
4–512	Subrecord 3–511 containing spacecraft housekeeping data from GEOTAIL minor frames 2–510	5599	582–6180
513	Subrecord 512 containing spacecraft housekeeping data from GEOTAIL minor frame 511	11	6181–6191
Total record length: 6192 bytes (1548 words)			

The GEOTAIL spacecraft housekeeping record observation mode and contingency mode subrecord format consists of an 11-byte logical subrecord for each minor frame in a major frame of telemetry. These 11 bytes correspond to the indicated 11 minor frame bytes of the GEOTAIL spacecraft record observation or contingency telemetry format.

Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10
Minor Frame Input Byte	5	6	7	8	9	10	11	12	13	14	15

3.3.3.2 WIND Spacecraft Housekeeping Data Record and Subrecord Formats

This section presents the housekeeping data record and subrecord formats for the WIND spacecraft. The formats for two WIND telemetry modes are provided: science telemetry and maneuver. Note that the maneuver mode record size applies for the entire day (midnight to midnight) of a maneuver.

3.3.3.2.1 WIND Science Mode Housekeeping Data Record and Subrecord Formats

The WIND spacecraft instrument generates 13 bytes of telemetry in each WIND minor frame during WIND science telemetry mode. In addition, the housekeeping record includes 2 bytes of instrument housekeeping data. Thus, the record contains 15 bytes. The following is the format of the level-zero-processed spacecraft housekeeping data record for the WIND science telemetry mode.

Note that the details regarding which minor frames of the instrument housekeeping bytes are allocated to a specific WIND instrument are provided in the subsections of Section 3.1.3.2, WIND Spacecraft Level-Zero Data Record and Subrecord Formats.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing spacecraft housekeeping data from WIND minor frame 0	15	300–314
3	Subrecord 2 containing spacecraft housekeeping data from WIND minor frame 1	15	315–329
4–250	Subrecord 3–249 containing spacecraft housekeeping data from WIND minor frames 2–248	3705	330–4034
251	Subrecord 250 containing spacecraft housekeeping data from WIND minor frame 249	15	4035–4049
252	Zero (null) bytes to pad record out to 4-byte word boundary	2	4050–4051
Total record length: 4052 bytes (1013 words)			

The WIND spacecraft science telemetry mode housekeeping format consists of a 15-byte logical subrecord for each minor frame of input telemetry. These 15 bytes correspond to the indicated 15 minor frame bytes of the GGS WIND spacecraft telemetry format.

	C&DH Status				ACADS					S/C HK				Inst. HK	
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Minor Frame Input Byte	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

3.3.3.2.2 WIND Maneuver Mode Housekeeping Data Record and Subrecord Formats

The WIND spacecraft generates 64 bytes of housekeeping telemetry in each WIND minor frame during WIND maneuver mode. In addition, the housekeeping record includes 2 bytes of instrument housekeeping data. Thus, the record contains 66 bytes. The following is the format of the level-zero-processed spacecraft housekeeping data record for the WIND maneuver mode.

Note that the details regarding which minor frames of the instrument housekeeping bytes are allocated to a specific WIND instrument are provided in the subsections of Section 3.1.3.2, WIND Spacecraft Level-Zero Data Record and Subrecord Formats.

Item	**Description**	**Length (bytes)**	**Record (bytes)**
1	Data record header	300	0–299
2	Subrecord 1 containing spacecraft housekeeping data from WIND minor frame 0	66	300–365
3	Subrecord 2 containing spacecraft housekeeping data from WIND minor frame 1	66	366–431
4–250	Subrecord 3–249 containing spacecraft housekeeping data from WIND minor frames 2–248	16,302	432–16,733
251	Subrecord 250 containing spacecraft housekeeping data from WIND minor frame 249	66	16,734–16,799
Total record length: 16,800 bytes (4200 words)			

The WIND spacecraft maneuver mode housekeeping subrecord consists of a 66-byte logical subrecord for each minor frame of input telemetry. These 66 bytes correspond to the indicated 66 bytes of the GGS WIND maneuver mode telemetry format.

	C&DH Status				ACADS					S/C HK				Inst. HK	
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Minor Frame Input Byte	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

	Sci. Data		Thruster Fire Information									
Subrecord Output Byte	15	16	17	18	19	20	21	22	23	24	25	26
Minor Frame Input Byte	19	20	21	22	23	24	25	26	27	28	29	30

	Accelerometer					CATBED Heater		ACC	CATBED Heater	ACADS Telemetry		
Subrecord Output Byte	27	28	29	30	31	32	33	34	35	36	37	38
Minor Frame Input Byte	31	47	63	79	95	105	109	111	113	117	121	125

	ACC	ACADS Telemetry			RCS	ACC	RCS			Power	ACC
Subrecord Output Byte	37	38	39	40	41	42	43	44	45	46	47
Minor Frame Input Byte	127	129	133	137	141	143	145	149	153	157	159

	LANYARD Boom Data		CAT-BED Heater	LANYARD Boom Data	CATBED Heater			Accel.	CAT-BED Heater	Power Comm
Subrecord Output Byte	48	49	50	51	52	53	54	55	56	57
Minor Frame Input Byte	161	165	166	169	170	173	174	175	177	178

	Power	Power Comm		Accelerometer				
Subrecord Output Byte	58	59	60	61	62	63	64	65
Minor Frame Input Byte	181	185	189	191	207	223	239	255

3.3.3.3 POLAR Spacecraft Housekeeping Data Record and Subrecord Formats

This section presents the housekeeping data record and subrecord formats for the POLAR spacecraft. Formats are provided for three telemetry modes: science telemetry, contingency, and maneuver. Note that the record size for maneuver mode applies for the entire day of a maneuver.

3.3.3.3.1 POLAR Science and Contingency Modes Housekeeping Data Record and Subrecord Formats

The POLAR spacecraft generates 7 bytes of housekeeping telemetry in each POLAR minor frame during both science telemetry and contingency modes. In addition, the housekeeping record includes 2 bytes of instrument housekeeping data. Thus, the record contains 9 bytes. The following is the format of the level-zero-processed spacecraft housekeeping data record for both modes.

Note that the details regarding which minor frames of the instrument housekeeping bytes are allocated to a specific POLAR instrument are provided in the subsections of Section 3.1.3.3, POLAR Spacecraft Level-Zero Data Record and Subrecord Formats.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing spacecraft housekeeping data from POLAR minor frame 0	9	300–308

Item	Description	Length (bytes)	Record (bytes)
3	Subrecord 2 containing spacecraft housekeeping data from POLAR minor frame 1	9	309–317
4–250	Subrecord 3–249 containing spacecraft housekeeping data from POLAR minor frames 2–248	2,223	318–2540
251	Subrecord 250 containing spacecraft housekeeping data from POLAR minor frame 249	9	2541–2549
252	Zero (null) fill bytes to pad out to minimum record length	242	2550–2791
Total record length: 2792 bytes (698 words)			

The POLAR spacecraft science telemetry housekeeping subrecord format consists of a 9-byte logical subrecord for each minor frame of telemetry. These 9 bytes correspond to the indicated 9 minor frame bytes of the GGS POLAR spacecraft telemetry format.

	C&DH Status	ACADS/ DPM Software	Uplink Status		S/C HK			Inst. HK	
Subrecord Output Byte	0	1	2	3	4	5	6	7	8
Minor Frame Input Byte	4	5	6	7	8	9	10	11	12

Note: The POLAR MFE magnetometer (mag) data can be retrieved from the instrument HK as follows:

- MNTSCALE (8-bit binary integer used for scaling the vectors) in minor frame input byte 12, minor frame 63
- BX (16-bit, two’s complement uncalibrated integer vector component) in minor frame input bytes 11 and 12, minor frame 87
- BY (16-bit, two’s complement uncalibrated integer vector component) in minor frame input bytes 11 and 12, minor frame 99
- BZ (16-bit, two’s complement uncalibrated integer vector component) in minor frame input bytes 11 and 12, minor frame 111

To access the MFE magnetometer data from the POLAR spacecraft housekeeping file, a user would call the ICSS routine to read in the spacecraft housekeeping file. The user would then use his/her code for extracting the MFE magnetometer data. An example of such a code is given in Figure 3–6.

The magnitude range of the raw BX, BY, BZ values could extend to ±32767 data numbers (dn) depending on the instrument setup (sensor and scale factor). Under normal operations, the goal is to maintain less than full-scale values (i.e., ±25000 dn).

To compute the B components in nanoteslas (nT), the following operations are performed using floating-point arithmetic:

- Bxcal = Bx av/(Cnts/nT)
- Bycal = By av/(Cnts/nT)
- Bzcal = Bz av/(Cnts/nT)

```
c
c     Example Code for Extracting MFE Data
c     From the POLAR SPACECRAFT Housekeeping Data
c
      subroutine get_polar_mag_data (major_frame, mntscale, bx, by, bz)
            byte major_frame (*)                 !    Buffer containing major frame
            integer*4  mntscale                  !    Magnetometer scale factor
            integer*4  bx, by, bz                !    Magnetometer vector

            integer*4  frame_no,                 !    Minor frame number
      .                index,                    !    Index into major frame buffer
      .                frame_size / 9 / ,        !    Minor frame size
      .                iword                     !    Equivalenced variable used to
                                                 !    transfer bytes to vector

            byte       bword (4)                 !    Equivalenced array

            equivalence (iword, bword(1))
c
c     Get the MNTSCALE value out of byte 7 (array index 8) of minor frame 63
c
            frame_no = 63
            index = 300 + (frame_no * frame_size) + 8

            bword(1) = major_frame (index)
            bword(2) = 0
            mntscale = iword
c
c     Get the BX value out of bytes 7 and 8 of minor frame 87
c
            frame_no = 87
            index = 300 + (frame_no * frame_size) + 8

            bword(2) = major_frame (index)
            bword(1) = major_frame (index+1)
            bx = iword
c
```

Figure 3–6. Code To Extract MFE Magnetometer Data From POLAR Housekeeping Data File (1 of 2)

```
c      Get the BY value out of bytes 7 and 8 of minor frame 99
c
              frame_no = 99
              index = 300 + (frame_no * frame_size) + 8

              bword(2) = major_frame (index)
              bword(1) = major_frame (index+1)
              by = iword
c
c      Get the BZ value out of bytes 7 and 8 of minor frame 111
c
              frame_no = 111
              index = 300 + (frame_no * frame_size) + 8

              bword(2) = major_frame (index)
              bword(1) = major_frame (index+1)
              bz = iword

              return
              end
```

Figure 3–6. Code To Extract MFE Magnetometer Data From POLAR Housekeeping Data File (2 of 2)

These major-frame-averaged (9.2 seconds) data are despun, corrected vector components in spacecraft coordinates.

To convert from raw instrument counts (Cnts), the parameter MNTSCALE is used to determine Cnts/nT as follows:

MNTSCALE	Cnts/nT
1	0.6875
11	5.5
11	5.5
88	44.0

The characteristics of the flight operational amplifiers resulted in a reduced maximum range for the magnetometers (<64KnT) and a reduced change between the magnetometers' high and low ranges (factor of 8 instead of 16). This has made it necessary to slightly modify the use of the 2*Cnts/nT field provided in the instrument engineering data.

The following table presents the values used:

Inst Mode Sens-Range	Engr Word 2*Cnts/nT (MNTSCALE)	Actual Cnts/nT	Full-Scale Field (32768 Cnts)
IN-HI	1	0.6875	47662.5nT
IN-LO	11	5.5	5957.82
OUT-HI	11	5.5	5957.82
OUT-LO	88	44.0	744.727

The Cnts/nT are prelaunch values that could change during on-orbit operations. Therefore, to facilitate updating these values, the KPGS should access them from a parameter file.

3.3.3.3.2 POLAR Spacecraft Maneuver Mode Housekeeping Data Record and Subrecord Formats

The POLAR spacecraft generates 50 bytes of spacecraft housekeeping telemetry in each POLAR minor frame during POLAR maneuver mode. In addition, the housekeeping record contains 2 bytes of instrument housekeeping data. Thus, the housekeeping records contain 52 bytes. The following is the format of the level-zero-processed POLAR data record for the POLAR maneuver mode.

Note that the details regarding which minor frames of the instrument housekeeping bytes are allocated to a specific POLAR instrument are provided in the subsections of Section 3.1.3.3, POLAR Spacecraft Level-Zero Data Record and Subrecord Formats.

Item	Description	Length (bytes)	Record (bytes)
1	Data record header	300	0–299
2	Subrecord 1 containing spacecraft housekeeping data from POLAR minor frame 0	52	300–351
3	Subrecord 2 containing spacecraft housekeeping data from POLAR minor frame 1	52	352–403
4–250	Subrecord 3–249 containing spacecraft housekeeping data from POLAR minor frames 2–248	12,844	404–13,247
251	Subrecord 250 containing spacecraft housekeeping data from POLAR minor frame 249	52	13,248–13,299
Total record length: 13,300 bytes (3325 words)			

The POLAR spacecraft maneuver mode housekeeping subrecord format consists of a 52-byte logical subrecord corresponding to the indicated 52 bytes of the GGS POLAR maneuver mode science telemetry format.

	C&DH Status	ACADS/ DPM	Uplink Status		S/C HK			Inst. HK		DPM		
Subrecord Output Byte	0	1	2	3	4	5	6	7	8	9	10	11
Minor Frame Input Byte	4	5	6	7	8	9	10	11	12	20	24	25

	DPM	ACC	DPM								S/C Telem-etry
Subrecord Output Byte	12	13	14	15	16	17	18	19	20	21	22
Minor Frame Input Byte	28	31	34	35	36	42	43	44	45	46	52

	S/C Telemetry		ACC	S/C Telemetry			ACC	S/C Telemetry		ACADS FSW
Subrecord Output Byte	23	24	25	26	27	28	29	30	31	32
Minor Frame Input Byte	60	61	63	68	76	84	95	100	108	116

	ACC	S/C Telemetry					ACC	S/C Telemetry	
Subrecord Output Byte	33	34	35	36	37	38	39	40	41
Minor Frame Input Byte	127	132	140	145	146	148	159	164	180

	ACC	S/C Telemetry			ACC	S/C Telemetry				ACC
Subrecord Output Byte	42	43	44	45	46	47	48	49	50	51
Minor Frame Input Byte	191	196	197	198	223	247	248	250	251	255

3.4 SIRIUS Data Format

This section describes the SIRIUS data format for nondecommutated telemetry data for the GEOTAIL mission. SIRIUS data is nondecommutated, quality checked, time-ordered telemetry in the format utilized by ISAS. During GEOTAIL's normal mode, the SIRIUS data for a day (24 hours, midnight-to-midnight GMT) is divided into four files. Each file covers approximately 6 hours and contains the telemetry for an integral number of major frames.

During GEOTAIL's high-rate (65 kbps) contingency mode, necessitated by a GEOTAIL spacecraft editor failure, the SIRIUS data for a day is divided into files covering a maximum of 1-1/2 hours each. This is a maximum of 16 files per day, but the coverage may not include the entire day (because of data gaps). Thus, there may be fewer than 16 files.

Figure 3–7 depicts the high-level format of a SIRIUS data file. A record in a SIRIUS data file contains 144 bytes. The records are placed in blocks of 160 records (23040 bytes) each. As shown in Figure 3–7, a SIRIUS data file has three parts: message data, telemetry data, and control block. The message data part occupies the first 20 records (2880 bytes) of the first 23040-byte block. (The remainder of this block is used for telemetry.) The detailed format of the message data portion is presented in Figure 3–8.

Message Data	Telemetry Data	Control Block
2880 bytes	144 bytes/minor frame x N Records	23040 bytes
(20 records at 144 bytes/record)	[N = approximate number of telemetry records (minor frames) in 6 hours (normal mode, 1-1/2 hours for contingency mode)]	(160 records at 144 bytes/record)
	160 records/block	
Note that the first block contains the message data (2880 bytes) followed by the first 140 records (20,160 bytes) of telemetry data.		

Figure 3–7. SIRIUS Data Format for Telemetry Playback Data

BYTE NO.	BYTE LENGTH	MESSAGE DATA			
1	2	X “FFFF”			
3	4	SATELLITE CODE (GEOTAIL:0023)			
7	10	PATH NUMBER. YYMMDD9999			
17	4	BLANK			
21	6	NUMBER OF FRAMES			
27	2	STATION ID			
29	2	DATA ID			
31	20	DATA NAME: EX. “GEOTAIL JKSC PLAYBACK DATA”			
51	30	FIRST FRAME	DATE:YYMMDD	(6C)	C:CHARACTER
			TIME:HHMMSSss	(9C)	minor frame count
			0	(1C)	
			FI COUNTER	(3C)	
			TI COUNTER	(10C)	
			BLANK	(1C)	
81	30	LAST FRAME	DATE:YYMMDD	(6C)	C:CHARACTER
			TIME:HHMMSSss	(9C)	32-bit time code
			0	(1C)	
			FI COUNTER	(3C)	
			TI COUNTER	(10C)	
			BLANK	(1C)	
111	30	TIME CORRELATION DATA	DATE:YYMMDD	(6C)	C:CHARACTER
			TIME:HHMMSSss	(9C)	
			0	(1C)	
			FI COUNTER	(3C)	
			TI COUNTER	(10C)	
			BLANK	(1C)	
141	4		BLANK	4C	
145	8		TI INTERVAL	(MILLISECOND)	
153	136		BLANK		
289	144		COMMENT		
433	144		BLANK		
577	144		MESSAGE DATA (RAW DATA)		
721	2160		BLANK		

Figure 3–8. Message Data Part of SIRIUS Data File

The telemetry data portion contains the telemetry for approximately 6 hours in normal mode or 1-1/2 hours in high-rate contingency mode. The telemetry for the period is divided into 144-byte records, each containing the data from a minor frame of telemetry. The first 140 records of telemetry data are used to fill up the first block (i.e., the block containing the message data). As necessary, zero (null)-filled records are used to fill out the last telemetry block to the 160-record block size. Table 3–6 depicts the format of the telemetry record. The quality bytes are defined in Table 3–7.

The control block occupies the last 23040-byte block in the file. Table 3–8 presents the detailed format of the control block.

Table 3–6. SIRIUS Telemetry Data Record

Byte No.	Content				
	Upper 4 Bits		Lower 4 Bits		
1	Leap year	(*)	Total day	(10**2)	(*) 1: Leap year
2	Total day	(10**1)	Total day	(10**0)	0: Otherwise
3	Hour	(10**1)	Hour	(10**0)	
4	Minute	(10**1)	Minute	(10**0)	
5	Second	(10**1)	Second	(10**0)	
6	Millisecond	(10**2)	Millisecond	(10**1)	
7	Millisecond	(10**0)			
8	Bit rate		Data/Identification		
9	8-bit frame counter (corrected)				
10	Time counter (2**31 - 2**24, corrected) Notation indicates a range of values				
11	Time counter (2**23 - 2**16, corrected)				
12	Time counter (2**15 - 2**8, corrected)				
13	Time counter (2**7 - 2**0, corrected)				
14	Frame quality indicators				
15	Spare (set to zero)				
16	Spare (set to zero)				
17	W-0 of minor frame				
18	W-1 of minor frame				
19	W-2 of minor frame				
:	:				
:	:				
143	W-126 minor frame				
144	W-127 minor frame				

Notes: 1. Time fields (lower 4 bits of byte 1 go upper 4 bits of byte 7) are represented in binary-coded decimal.
2. Bit settings for bit rate and data identification fields are set according to compliance with the ISAS settings in their real-time data processing.
3. The format of the frame quality indicators byte (byte 14) is defined in Table 3–10.
4. The minor frame format (bytes 17 through 144) is defined in the Systems and Operations Requirements Document for GEOTAIL.

Table 3–7. GEOTAIL Frame Quality Indicators Format

Bit Number	Content
0 (MSB)	Always 0
1	Always 0
2	Frame counter correction This quality flag is set to a 1 if a fill minor frame (containing all zeros) was inserted in the dataset to replace a minor frame which could not be placed in time order during level-zero processing because of errors in the fields.
3	Always 0
4	Frame sync error detected This quality flag is set to a 1 if one or more bit errors in the frame sync pattern were detected for this particular minor frame.
5	Always 0
6	
7 (LSB)	Spare (set to 0)

Notes: 1. MSB is most significant bit; LSB is least significant byte.
2. These frame quality indicators are set to zero for now as specified by ISAS.

Table 3–8. Control Block for SIRIUS Data

Byte No.	Length in Bytes	Name/Short Description
1	2	Message data pattern, X “FEFE”
3	2	Number of data blocks (16-bit binary)
5	4	Spacecraft clock reading at first frame in first block (32-bit time count)
9	4	Block address of first block (number of the block within the file) (32-bit binary)
13	4	Spacecraft clock reading at first frame in second block
17	4	Block address of second block
: :	: :	: :
	4	Spacecraft clock reading at first frame in nth block
	4	Block address of nth block
		Null bytes to fill the block to the 23,040-byte block size
Total block size = 23,040 bytes		

MESSAGE DATA DESCRIPTION

Note that the character code used is Extended Binary-Coded Decimal Interchange Code (EBCDIC).

Field Name:	**Message Data Pattern**
Type/Length:	X*2
Definition:	Fixed pattern to identify beginning of message data portion of file.
Value(s):	X "FFFF"

Field Name:	**Satellite Code**
Type/Length:	C*4
Definition:	Identifies the spacecraft
Value(s):	"0023" for GEOTAIL

Field Name:	**File (Path) Number**
Type/Length:	C*10
Definition:	The file identifier in the form YYMMDDXXXX where YY is the 2-digit year, MM is the 2-digit month, and XXXX identifies which of the sixteen files for the day.
Value(s):	For XXXX "0000" First file "0100" Second file "0200" Third file "0300" Fourth file

Field Name:	**Number of Frames**
Type/Length:	C*6
Definition:	Number of frames of telemetry in file.

Field Name:	**Station ID**
Type/Length:	C*2
Definition:	Station identification field (which DSN station is not distinguished).
Value(s):	"20" (DSN)

Field Name:	**Data ID**
Type/Length:	C*2
Definition:	Type of data (always playback).
Value(s):	"02" (playback data)

Field Name: **Data Name**
Type/Length: C*20
Definition: Name of the data, for example:
"GEOTAIL JKSC REAL-TIME DATA"

Field Name: **First Frame**
Type/Length: C*30
Definition: First Frame comprises the following four subfields:
date, time, FI counter, and TI counter.

Field Name: **Date of First Frame**
Type/Length: C*6
Definition: Date spacecraft generated first frame of telemetry in the form YYMMDD where YY is the 2-digit year, MM is the 2-digit month, and DD is the 2-digit day of the month.

Field Name: **Time of First Frame**
Type/Length: C*9
Definition: Time spacecraft generated first frame of telemetry in the form HHMMSSsss where HH is the 2-digit hour, MM is the 2-digit minute, SS is the 2-digit seconds, and sss is the fractional (milli) seconds.

Field Name: **FI Counter for First Frame**
Type/Length: C*3
Definition: Minor frame counter

Field Name: **TI Counter for First Frame**
Type/Length: C*10
Definition: 32-bit time code in decimal expression (unsigned).

Field Name: **Last Frame**
Type/Length: C*30
Definition: Last frame comprises the following four subfields:
date, time, FI counter, and TI counter.

Field Name: **Date of Last Frame**
Type/Length: C*6
Definition: Date spacecraft generated last frame of telemetry in the form YYMMDD where YY is the 2-digit year, MM is the 2-digit month, and DD is the 2-digit day of the month.

Field Name: **Time of Last Frame**
Type/Length: C*9
Definition: Time spacecraft generated first frame of telemetry in the form HHMMSSsss where HH is the 2-digit hour, MM is the 2-digit minute, SS is the 2-digit seconds, and sss is the fractional (milli) seconds.

Field Name: **FI Counter for Last Frame**
Type/Length: C*3
Definition: Minor frame counter

Field Name: **TI Counter for Last Frame**
Type/Length: C*10
Definition: 32-bit time code in decimal expression (unsigned)

Field Name: **Time Correlation Data**
Type/Length: C*30
Definition: Time correlation data comprises the following four subfields: date, time, FI counter, and TI counter.

Field Name: **Date**
Type/Length: C*6
Definition: Date in the form YYMMDD where YY is the 2-digit year, MM is the 2-digit month, and DD is the 2-digit day of the month.

Field Name: **Time**
Type/Length: C*9
Definition: Time in the form HHMMSSsss where HH is the 2-digit hour, MM is the 2-digit minute, SS is the 2-digit seconds, and sss is the fractional (milli) seconds.

Field Name: **FI Counter**
Type/Length: C*3
Definition: Minor frame counter

Field Name: **TI Counter**
Type/Length: C*10
Definition: 32-bit time code in decimal expression (unsigned)

Field Name: **TI Interval**
Type/Length: C*8
Definition: TI interval in milliseconds.
Value(s): "31.25000"

Field Name: **Comment**
Type/Length: C*144
Definition: Free text comment, as appropriate

Field Name: **Message (Raw) Data**
Type/Length: C*144
Definition: Always blank

CONTROL BLOCK DESCRIPTION

The purpose of the Control Block is for quick referencing of the SIRIUS data after it has been stored on a disk by ISAS.

Field Name: **Control Block Identifying Pattern**
Type/Length: X*2
Definition: Fixed hexadecimal pattern to identify beginning of control block.
Value(s): X "FEFE"

Field Name: **Number of Data Blocks**
Type/Length: I*2 (16 bits binary)
Definition: Total number of 23040-byte data blocks in file.

Field Name: **Time of First Frame in Block**
Type/Length: I*4 (32 bits binary)
Definition: Time of first minor frame in the block (32-bit time code).

Field Name: **Block Address**
Type/Length: I*4 (32-bit binary)
Definition: Number of the block in file, beginning with 1, 2, 3, 4, ...

3.5 Command History Format

A spacecraft command history file contains data covering a 24-hour, midnight-to-midnight GMT period. The file contains command history information in chronological order.

3.5.1 GEOTAIL Command History Format

This section provides the GEOTAIL command history format. Table 3–9 presents the GEOTAIL command history data format.

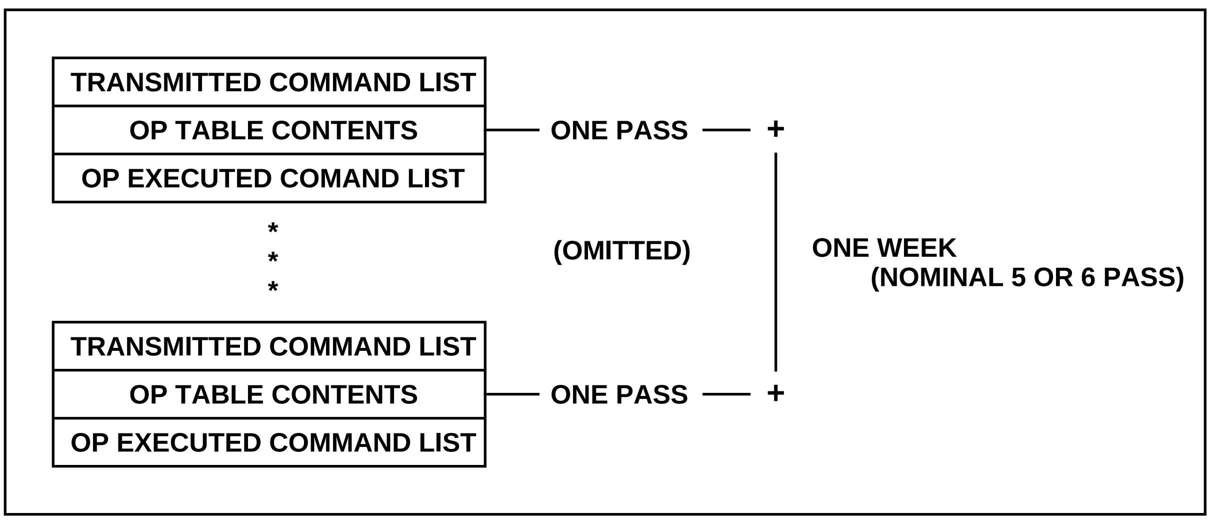
3.5.1.1 Command History File Outline

The command history file will be generated when the spacecraft contact from UDSC is over. It consists of a transmitted command list with the answer-back status, an OP table contents and an OP executed command list (ASCII-code).

ISAS will transfer the command history file to the CDHF once a week. It includes one-week (nominal 5 or 6 pass) command history data.

Note: The WIND and POLAR command history formats are provided in the ICD between the ISTP WIND/POLAR CMS and the POCC (Reference 11).

Table 3–9. GEOTAIL Command History File Configuration



3.5.1.2 Transmitted Command List

This section provides and explains the Transmitted Command List.

3.5.1.2.1 Transmitted Command List File Format

```
1          10         20         30         40         50         60         70   80

                        PASS      YYMMDD–9999      START          +
                              SA   = 00   GEOTAIL                 |   HEADER
                                TIME=HH:MM:SS                     +

-NO--ID--IC-CMD----ITEM-----SCHEDULE--TRANSMIT-CMD VERIFY-E-C-S-S/S TX COUNT-
/ / / / / / / / / / / / / / / / / / / XMIT  START   TIME : HH:MM:SS / / / / / / / / / / / / / / / / / / /

X999   XX   99-99   XXXXXXXXXXXX   HH:MM:SS   HH:MM:SS   HH:MM:SS   X X X   (99999/99999)
X999   XX   99-99   XXXXXXXXXXXX   HH:MM:SS   HH:MM:SS   HH:MM:SS   X X X   (99999/99999)
X999   XX   99-99   XXXXXXXXXXXX   HH:MM:SS   HH:MM:SS   HH:MM:SS   X X X   (99999/99999)
X999   XX   99-99   XXXXXXXXXXXX   HH:MM:SS   HH:MM:SS   HH:MM:SS   X X X   (99999/99999)
X999   XX   99-99   XXXXXXXXXXXX   HH:MM:SS   HH:MM:SS   HH:MM:SS   X X X   (99999/99999)
X999   XX   99-99   XXXXXXXXXXXX   HH:MM:SS   HH:MM:SS   HH:MM:SS   X X X   (99999/99999)

/ / / / / / / / / / / / / / / / / / / XMIT  END   TIME : HH:MM:SS / / / / / / / / / / / / / / / / / / /

                        PASS      YYMMDD–9999      END            +
                              SA   = 99   GEOTAIL                 |
                                TIME=HH:MM:SS                     +
```

3.5.1.2.2 Explanation of the Transmitted Command List

Item	Address	Size	Description
Command identifier	(2:2)	1	‘A’: Command Answer Back (CAB) ‘ ’: Transmitted Command ‘*’: Not-scheduled Command
Block no.	(3:5)	2	
Command type	(8:9)	2	DC, BC, C. (command), S. (submenu)
Command code	(12:16)	5	IC+XY
Command name	(18:29)	12	
Scheduled time	(31:38)	8	UTC
Transmitted time	(41:48)	8	UTC
Answerback time	(51:58)	8	UTC
Echo result	(61:61)	1	‘1’: OK ‘0’: NG
CAB status	(63:63)	1	‘1’: OK ‘0’: NG
SI status	(65:65)	1	‘1’: OK ‘0’: NG
Total number in submenu	(68:72)	5	
Residual number of submenu	(74:78)	5	

3.5.1.3 OP Table Contents

This section provides and explains the OP Table Contents.

3.5.1.3.1 OP Table Contents File Format

1 10 20 30 40 50 60 70 80

HEADER:

OP TABLE CONTENTS
START DATE=YY.MM.DD
START TIME=YY.MM.DD

CE No.	Mode	CE/OG Address	Loop No./Interval	Date/Time
999	XXXX	99	9999	YY.MM.DD HH.MM.SS
999	XXXX	99	9999	YY.MM.DD HH.MM.SS
999	XXXX	99	9999	YY.MM.DD HH.MM.SS
999	XXXX	99	9999	YY.MM.DD HH.MM.SS
999	XXXX	99	9999	YY.MM.DD HH.MM.SS
999	XXXX	99	9999	YY.MM.DD HH.MM.SS
999	XXXX	99	9999	YY.MM.DD HH.MM.SS
999	XXXX	99	9999	YY.MM.DD HH.MM.SS

FOOTER:

OP TABLE CONTENTS
END DATE=YY.MM.DD
END TIME=YY.MM.DD

3.5.1.3.2 Explanation of OP Table Contents

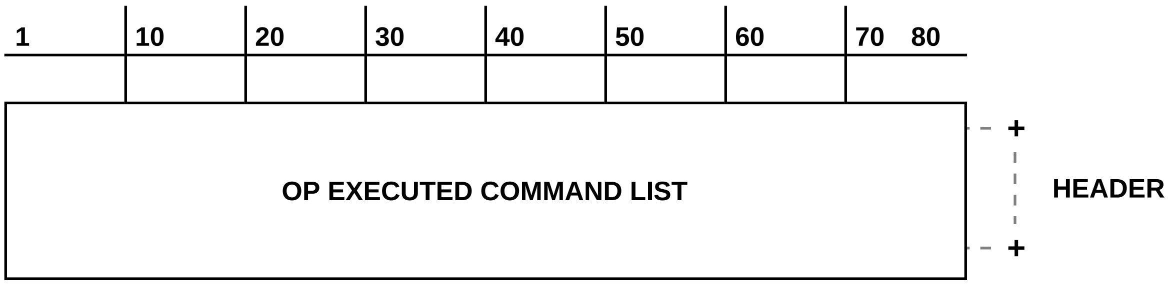
Item	Address	Size	Description
CE no.	(4:6)	2	‘0’ ~ ‘127’
Mode	(16:19)	4	‘----’: there is no mode ‘Jump’: Jump mode ‘Loop’: Loop mode
CE/OG address	(33:34)	2	Hexadecimal numeral
Loop no./interval	(50:53)	4	Loop count in case of back loop or the time interval until the next OG is executed (binary numeral)
Date/time	(63:79)	17	Executed date/time (UTC)

Note: ‘Jump’ and/or ‘Loop’ has already unfolded in this table

3.5.1.4 OP Executed Command List

This section provides and explains the OP Executed Command List.

3.5.1.4.1 OP Executed Command List File Format



OG Address 99

No.	ID	IC+XY	Command	No.	ID	IC+XY	Command
1	XX	XX–XX	XXXXXXXXXXXX	17	XX	XX–XX	XXXXXXXXXXXX
2	XX	XX–XX	XXXXXXXXXXXX	18	XX	XX–XX	XXXXXXXXXXXX
3	XX	XX–XX	XXXXXXXXXXXX	19	XX	XX–XX	XXXXXXXXXXXX
4	XX	XX–XX	XXXXXXXXXXXX	20	XX	XX–XX	XXXXXXXXXXXX
5	XX	XX–XX	XXXXXXXXXXXX	21	XX	XX–XX	XXXXXXXXXXXX
6	XX	XX–XX	XXXXXXXXXXXX	22	XX	XX–XX	XXXXXXXXXXXX
7	XX	XX–XX	XXXXXXXXXXXX	23	XX	XX–XX	XXXXXXXXXXXX
8	XX	XX–XX	XXXXXXXXXXXX	24	XX	XX–XX	XXXXXXXXXXXX
9	XX	XX–XX	XXXXXXXXXXXX	25	XX	XX–XX	XXXXXXXXXXXX
10	XX	XX–XX	XXXXXXXXXXXX	26	XX	XX–XX	XXXXXXXXXXXX
11	XX	XX–XX	XXXXXXXXXXXX	27	XX	XX–XX	XXXXXXXXXXXX
12	XX	XX–XX	XXXXXXXXXXXX	28	XX	XX–XX	XXXXXXXXXXXX
13	XX	XX–XX	XXXXXXXXXXXX	29	XX	XX–XX	XXXXXXXXXXXX
14	XX	XX–XX	XXXXXXXXXXXX	30	XX	XX–XX	XXXXXXXXXXXX
15	XX	XX–XX	XXXXXXXXXXXX	31	XX	XX–XX	XXXXXXXXXXXX
16	XX	XX–XX	XXXXXXXXXXXX	32	XX	XX–XX	XXXXXXXXXXXX

OG Address 99

No.	ID	IC+XY	Command	No.	ID	IC+XY	Command
1	XX	XX–XX	XXXXXXXXXXXX	17	XX	XX–XX	XXXXXXXXXXXX
2	XX	XX–XX	XXXXXXXXXXXX	18	XX	XX–XX	XXXXXXXXXXXX
3	XX	XX–XX	XXXXXXXXXXXX	19	XX	XX–XX	XXXXXXXXXXXX

3.5.1.4.2 Explanation of OP Executed Command List

Item	Address	Size	Description
OG Address	(12:13)	2	Hexadecimal numeral
	(7:8)	2	Command type : DC, BC
	(41:42)	2	Command type : DC, BC
	(11:15)	5	
	(45:49)	5	
	(18:29)	12	Command name
	(52:53)	12	Command name

Note: Organized Command (OG) includes maximum 32 items of OG Elements each of which consists of DC or BC with IC.

3.6 Orbit Formats

Orbit files are provided in CDF. Refer to Reference 3 for information on extracting orbit data from the CDF. The CDF skeleton table for orbit data is shown in Table 3–10.

Note: The remainder of this section (i.e., 3.6) becomes effective with CDHF software Release 6.2F.

POLAR orbit data files contain six additional variables:

- Calculated eccentric dipole magnetic local time
- Calculated magnetic latitude
- Computed L_SHELL parameter
- Orbit rev number
- Epoch of node crossing
- Record number of next node crossing

These six variables are added when POLAR orbit CDF files are created as shown in Table 3–10a.

The information on the node crossings for the POLAR orbit was implemented as a linked list in the CDF file which provides a quicker mechanism to locate where the crossings occur rather than searching through the file record by record.

The global section of the CDF has pointers to the first and last record in the linked list. In addition, the global section has the number of node crossings in the file, the orbit rev number for the first and last crossings in the file.

Table 3–10. ISTP Orbit CDF (1 of 12)

```
#header

!       SKELETON TABLE FOR THE ORBIT CDF
                CDF NAME : ORBIT
                DATA ENCODING : NETWORK
                MAJORITY : COLUMN
                FORMAT : SINGLE

! Variables  G. Attributes   V.Attributes  Records  Dims  Sizes
! ---------  -------------   ------------- -------  ----  -----
      14          48              17          0      1      3

!-------------------------------------------------------------
#GLOBALattributes

! Attribute                Entry    Data       Value
! Name                     Number   Type
! ---------                ------   ----       -----
  "TITLE"                  1:     CDF_CHAR   {"ISTP ORBIT CDF "}.
  "Project"                1:     CDF_CHAR   {"ISTP>International " -
                                              "Solar-Terrestrial Physics"}.
  "Discipline"             1:     CDF_CHAR   {"Space Physics"}.
  "Source_name"            1:     CDF_CHAR   {"                                  "-
                                              "          "}.
  "Data_version"           1:     CDF_CHAR   {" "}.
  "MESSAGE_ID"             1:     CDF_CHAR   {"        "}.
  "SUPPORT_ID"             1:     CDF_CHAR   {"    "}.
  "ADID_ref"               1:     CDF_CHAR   {"NSSD0092"}.
  "Logical_file_id"        1:     CDF_CHAR   {"                      "}.
  "Data_type"              1:     CDF_CHAR   {" "}.
  "Descriptor"             1:     CDF_CHAR   {" "}.
  "TIME_SYSTEM"            1:     CDF_CHAR   {" "}.
  "EPOCH_DATE"             1:     CDF_CHAR   {"                        "}.
  "START_DATE"             1:     CDF_CHAR   {"                        "}.
  "END_DATE"               1:     CDF_CHAR   {"                        "}.
  "START_GH_ANGLE"         1:     CDF_CHAR   {"        "}.
  "END_GH_ANGLE"           1:     CDF_CHAR   {"        "}.
  "LEAP_FLAG"              1:     CDF_CHAR   {" "}.
  "LEAP_DATE"              1:     CDF_CHAR   {"                        "}.
  "UTC_ADJUST"             1:     CDF_CHAR   {"        "}.
  "RADIAL_MIN_POS_DIFF"    1:     CDF_CHAR   {" "}
                           2:     CDF_CHAR   {" "}
                           3:     CDF_CHAR   {" "}.
  "RADIAL_MAX_POS_DIFF"    1:     CDF_CHAR   {" "}
                           2:     CDF_CHAR   {" "}
                           3:     CDF_CHAR   {" "}.
  "CRS_TRK_MIN_POS_DIFF"   1:     CDF_CHAR   {" "}
                           2:     CDF_CHAR   {" "}
                           3:     CDF_CHAR   {" "}.
  "CRS_TRK_MAX_POS_DIFF"   1:     CDF_CHAR   {" "}
                           2:     CDF_CHAR   {" "}
                           3:     CDF_CHAR   {" "}.
  "ALNG_TRK_MIN_POS_DIFF"  1:     CDF_CHAR   {" "}
                           2:     CDF_CHAR   {" "}
                           3:     CDF_CHAR   {" "}.
```

Table 3–10. ISTP Orbit CDF (2 of 12)

```
"ALNG_TRK_MAX_POS_DIFF" 1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"DELTA_R_MIN_POS_DIFF"  1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"DELTA_R_MAX_POS_DIFF"  1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"RADIAL_MIN_VEL_DIFF"   1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"RADIAL_MAX_VEL_DIFF"   1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"CRS_TRK_MIN_VEL_DIFF"  1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"CRS_TRK_MAX_VEL_DIFF"  1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"ALNG_TRK_MIN_VEL_DIFF" 1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"ALNG_TRK_MAX_VEL_DIFF" 1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"DELTA_V_MIN_VEL_DIFF"  1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"DELTA_V_MAX_VEL_DIFF"  1:     CDF_CHAR   {" "}
                        2:     CDF_CHAR   {" "}
                        3:     CDF_CHAR   {" "}.
"RADIAL_POS_RMS"        1:     CDF_CHAR   {" "}.
"RADIAL_VEL_RMS"        1:     CDF_CHAR   {" "}.
"CRS_TRK_POS_RMS"       1:     CDF_CHAR   {" "}.
"CRS_TRK_VEL_RMS"       1:     CDF_CHAR   {" "}.
"ALNG_TRK_POS_RMS"      1:     CDF_CHAR   {" "}.
"ALNG_TRK_VEL_RMS"      1:     CDF_CHAR   {" "}.
"TOTAL_POS_RMS"         1:     CDF_CHAR   {" "}.
"TOTAL_VEL_RMS"         1:     CDF_CHAR   {" "}.
"COMMENT1"              1:     CDF_CHAR   {"                             "-
                                           "                             "-
                                           "                    "}.
"COMMENT2"              1:     CDF_CHAR   {"                             "-
                                           "                             "-
                                           "                    "}.
"TEXT"                  1:     CDF_CHAR   {"TBS"}.
"MODS"                  1:     CDF_CHAR   {"Originated Monday, May 13,1991"}
                        2:     CDF_CHAR   {"Modified June 13, 1991 "-
                                           "for version 2.1"}
                        3:     CDF_CHAR   {"Modified October 2,1991 for new"-
                                           " global attributes, incr sizes"}
```

Table 3–10. ISTP Orbit CDF (3 of 12)

```
                          4:     CDF_CHAR   {"Modified 11/11/91 Add sun "-
                                             "vector, replace space id with "-
                                             "support id"}
                          5:     CDF_CHAR   {"Modified 1992 Feb 11 to use the "-
                                             "variable name TIME and type "-
                                             "CDF_INT4 instead of "}
                          6:     CDF_CHAR   {"EPOCH and CDF_EPOCH for the "-
                                             "time tags CCR 490"}
                          7:     CDF_CHAR   {"Modified 6/2/92 add project, "-
                                             "discipline, source_name, "-
                                             "data_version, title, and "}
                          8:     CDF_CHAR   {"mods to global section; add "-
                                             "validmin, validmax, labl_ptr_1 "-
                                             "and monoton "}
                          9:     CDF_CHAR   {"attributes to some variables; "-
                                             "put epoch time back in, "-
                                             "rename time to "}
                         10:     CDF_CHAR   {"time_pb5; add label_time to "-
                                             "variables"}
                         11:     CDF_CHAR   {"Modified 11/07/92 to use Epoch "-
                                             "and Time_PB5 variable name"}
                         12:     CDF_CHAR   {"Modified 6/2/93 add ADID_ref "-
                                             "and Logical_file_id"}
                         13:     CDF_CHAR   {"7/5/94 - CCR ISTP 1852 "-
                                             "updated CDHF skeleton to "-
                                             "CDF standards - JT"}
                         14:     CDF_CHAR   {"9/21/94 - Added 24 new global " -
                                             "attributes to log the ephemeris "}
                         15:     CDF_CHAR   {"comparison summary report from " -
                                             "the definitive FDF orbit " -
                                             "file.  CCR 1932"}
                         16:     CDF_CHAR   {"11/7/94 - Merged CCR 1852 " -
                                             "changes and corrected errors "}
                         17:     CDF_CHAR   {"made in CCR 1852.  ICCR 1884"}
                         18:     CDF_CHAR   {"12/7/94 - Modified MODS to " -
                                             "follow ISTP standards.  " -
                                             "ICCR 1885"}
                         19:     CDF_CHAR   {"01/05/95 - add heliocentric " -
                                             "coordinate system.  CCR 1889"}
                         20:     CDF_CHAR   {"2/28/95 - added COMMENT1 and"-
                                             " COMMENT2 for CCR "}.
"FIRST_CROSSING"          1:     CDF_INT4   {0}.
"LAST_CROSSING"           1:     CDF_INT4   {0}.
"NUM_CROSSING"            1:     CDF_INT4   {0}.
"INIT_ORB_REV"            1:     CDF_INT4   {0}.
"LAST_ORB_REV"            1:     CDF_INT4   {0}.

!------------------------------------------------------------
VARIABLEattributes

   "FIELDNAM"
   "VALIDMIN"
```

```
   "VALIDMAX"
   "SCALEMIN"
   "SCALEMAX"
   "LABLAXIS"
   "UNITS"
   "FORMAT"
   "LABL_PTR_1"
   "UNIT_PTR"
   "FORM_PTR"
   "MONOTON"
   "DEPEND_0"
   "DEPEND_1"
   "FILLVAL"
   "VAR_TYPE"
   "DICT_KEY"

!--------------------------------------------------------------
#variables

!   Variable         Data            Number     Record       Dim
!   Name             Type            Elements   Variance     Variance
!   -------          ----            --------   --------     --------
    "Epoch"          CDF_EPOCH          1           T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Orbit Epoch Time" }
   "VALIDMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "VALIDMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "SCALEMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "SCALEMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "LABLAXIS"  CDF_CHAR      { "Epoch" }
   "UNITS"     CDF_CHAR      { "ms" }
   "MONOTON"   CDF_CHAR      { "INCREASE" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!--------------------------------------------------------------
!   Variable         Data            Number     Record       Dim
!   Name             Type            Elements   Variance     Variance
!   -------          ----            --------   --------     --------
    "Time_PB5"       CDF_INT4           1           T            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Orbit PB5 Time" }
   "VALIDMIN"   CDF_INT4      { 1992, 183, 0 }
   "VALIDMAX"   CDF_INT4      { 2020, 366, 86399000 }
   "SCALEMIN"   CDF_INT4      { 1992, 183, 0 }
   "SCALEMAX"   CDF_INT4      { 2020, 366, 86399000 }
   "LABL_PTR_1" CDF_CHAR      { "label_time" }
```

Table 3–10. ISTP Orbit CDF (5 of 12)

```
   "UNIT_PTR"   CDF_CHAR      { "unit_time" }
   "FORM_PTR"   CDF_CHAR      { "format_time" }
   "DEPEND_0"   CDF_CHAR      { "Epoch" }
   "DEPEND_1"   CDF_CHAR      { "unit_time" }
   "FILLVAL"    CDF_INT4      { -2147483648 }
   "VAR_TYPE"   CDF_CHAR      { "data" }
   "DICT_KEY"   CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "label_time"     CDF_CHAR           27          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Label for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.
    [1] = {"Year                      "}
    [2] = {"Day of Year (Jan 1 = day 1)"}
    [3] = {"elapsed ms of day         "}

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "unit_time"      CDF_CHAR            4          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Units for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

    [1] = {"year"}
    [2] = {"day "}
    [3] = {"msec"}

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "format_time"    CDF_CHAR            2          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Formats for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
```

Table 3–10. ISTP Orbit CDF (6 of 12)

```
  "DICT_KEY"   CDF_CHAR      { " " }.

   [1] = {"I4"}
   [2] = {"I3"}
   [3] = {"I8"}

!--------------------------------------------------------------
!   Variable         Data            Number     Record       Dim
!   Name             Type            Elements   Variance     Variance
!   --------         ----            --------   --------     --------
    "GCI_POS"      CDF_REAL8            1          T            T

!  Attribute   Data          Value
!  Name        Type
!----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI Cartesian Position" }
   "VALIDMIN"  CDF_REAL8     { -1800000.0 }
   "VALIDMAX"  CDF_REAL8     { 1800000.0 }
   "SCALEMIN"  CDF_REAL8     { -1800000.0 }
   "SCALEMAX"  CDF_REAL8     { 1800000.0 }
   "LABLAXIS"  CDF_CHAR      { "Cart Pos" }
   "UNITS"     CDF_CHAR      { "km" }
   "FORMAT"    CDF_CHAR      { "F17.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "DEPEND_1"  CDF_CHAR      { "cartesian" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!--------------------------------------------------------------
!   Variable         Data            Number     Record       Dim
!   Name             Type            Elements   Variance     Variance
!   -------          ----            --------   --------     --------
    "GCI_VEL"      CDF_REAL8            1          T            T

!  Attribute   Data          Value
!  Name        Type
!----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI Cartesian Velocity" }
   "VALIDMIN"  CDF_REAL8     { -12.0 }
   "VALIDMAX"  CDF_REAL8     { 12.0 }
   "SCALEMIN"  CDF_REAL8     { -12.0 }
   "SCALEMAX"  CDF_REAL8     { 12.0 }
   "LABL_PTR_1"  CDF_CHAR      { "label_v" }
   "UNITS"     CDF_CHAR      { "km/sec" }
   "FORMAT"    CDF_CHAR      { "F12.7" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "DEPEND_1"  CDF_CHAR      { "cartesian" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
```

Table 3–10. ISTP Orbit CDF (7 of 12)

```
!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "label_v"      CDF_CHAR              2          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Label for velocity" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

    [1] = {"vx"}
    [2] = {"vy"}
    [3] = {"vz"}

!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "cartesian"    CDF_CHAR              1          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Components in cartesian coord." }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { "ISTP>vector>cartesian" }.

    [1] = {"x"}
    [2] = {"y"}
    [3] = {"z"}

!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   --------         ----             --------   --------     --------
    "GSE_POS"      CDF_REAL8             1          T             T

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE Cartesian Position" }
   "VALIDMIN"  CDF_REAL8     { -1800000.0 }
   "VALIDMAX"  CDF_REAL8     { 1800000.0 }
   "SCALEMIN"  CDF_REAL8     { -1800000.0 }
   "SCALEMAX"  CDF_REAL8     { 1800000.0 }
   "LABLAXIS"  CDF_CHAR      { "Cart pos" }
   "UNITS"     CDF_CHAR      { "km" }
   "FORMAT"    CDF_CHAR      { "F17.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "DEPEND_1"  CDF_CHAR      { "cartesian" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
```

Table 3–10. ISTP Orbit CDF (8 of 12)

```
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!--------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "GSE_VEL"      CDF_REAL8             1          T            T

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE Cartesian Velocity" }
   "VALIDMIN"  CDF_REAL8     { -12.0 }
   "VALIDMAX"  CDF_REAL8     { 12.0 }
   "SCALEMIN"  CDF_REAL8     { -12.0 }
   "SCALEMAX"  CDF_REAL8     { 12.0 }
   "LABL_PTR_1"  CDF_CHAR      { "label_v" }
   "UNITS"     CDF_CHAR      { "km/sec" }
   "FORMAT"    CDF_CHAR      { "F12.7" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "DEPEND_1"  CDF_CHAR      { "cartesian" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!--------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   --------         ----             --------   --------     --------
    "GSM_POS"      CDF_REAL8             1          T            T

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM Cartesian Position" }
   "VALIDMIN"  CDF_REAL8     { -1800000.0 }
   "VALIDMAX"  CDF_REAL8     { 1800000.0 }
   "SCALEMIN"  CDF_REAL8     { -1800000.0 }
   "SCALEMAX"  CDF_REAL8     { 1800000.0 }
   "LABLAXIS"  CDF_CHAR      { "Cart pos" }
   "UNITS"     CDF_CHAR      { "km" }
   "FORMAT"    CDF_CHAR      { "F17.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "DEPEND_1"  CDF_CHAR      { "cartesian" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }

!--------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "GSM_VEL"      CDF_REAL8             1          T            T
```

Table 3–10. ISTP Orbit CDF (9 of 12)

```
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM Cartesian Velocity" }
   "VALIDMIN"  CDF_REAL8     { -12.0 }
   "VALIDMAX"  CDF_REAL8     { 12.0 }
   "SCALEMIN"  CDF_REAL8     { -12.0 }
   "SCALEMAX"  CDF_REAL8     { 12.0 }
   "LABL_PTR_1"  CDF_CHAR      { "label_v" }
   "UNITS"     CDF_CHAR      { "km/sec" }
   "FORMAT"    CDF_CHAR      { "F12.7" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "DEPEND_1"  CDF_CHAR      { "cartesian" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!--------------------------------------------------------------
!   Variable          Data            Number     Record       Dim
!   Name              Type            Elements   Variance     Variance
!   -------           ----            --------   --------     --------
    "SUN_VECTOR"   CDF_REAL8             1          T            T

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI Sun Postion Vector" }
   "VALIDMIN"  CDF_REAL8     { -1.6E8 }
   "VALIDMAX"  CDF_REAL8     { 1.6E8 }
   "SCALEMIN"  CDF_REAL8     { -1.6E8 }
   "SCALEMAX"  CDF_REAL8     { 1.6E8 }
   "LABLAXIS"  CDF_CHAR      { "Sun pos V" }
   "UNITS"     CDF_CHAR      { "km" }
   "FORMAT"    CDF_CHAR      { "F17.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "DEPEND_1"  CDF_CHAR      { "cartesian" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!--------------------------------------------------------------
!   Variable          Data            Number     Record       Dim
!   Name              Type            Elements   Variance     Variance
!   --------          ----            --------   --------     --------
    "HEC_POS"      CDF_REAL8             1          T            T

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "HEC Cartesian Position" }
   "VALIDMIN"  CDF_REAL8     { -1800000.0 }
   "VALIDMAX"  CDF_REAL8     { 1800000.0 }
   "SCALEMIN"  CDF_REAL8     { -1800000.0 }
   "SCALEMAX"  CDF_REAL8     { 1800000.0 }
```

Table 3–10. ISTP Orbit CDF (10 of 12)

```
   "LABLAXIS"  CDF_CHAR      { "Cart Pos" }
   "UNITS"     CDF_CHAR      { "km" }
   "FORMAT"    CDF_CHAR      { "F17.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "DEPEND_1"  CDF_CHAR      { "cartesian" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "HEC_VEL"       CDF_REAL8            1          T            T

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "HEC Cartesian Velocity" }
   "VALIDMIN"  CDF_REAL8     { -12.0 }
   "VALIDMAX"  CDF_REAL8     { 12.0 }
   "SCALEMIN"  CDF_REAL8     { -12.0 }
   "SCALEMAX"  CDF_REAL8     { 12.0 }
   "LABL_PTR_1"  CDF_CHAR      { "label_v" }
   "UNITS"     CDF_CHAR      { "km/sec" }
   "FORMAT"    CDF_CHAR      { "F12.7" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "DEPEND_1"  CDF_CHAR      { "cartesian" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "CRN"           CDF_INT4             1          T            F
!  Attribute   Data          Value
!  Name        Type          Carrington Rotation Number
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { " " }
   "VALIDMIN"  CDF_INT4      { 1857 }
   "VALIDMAX"  CDF_INT4      { 2239 }
   "SCALEMIN"  CDF_INT4      { 1857 }
   "SCALEMAX"  CDF_INT4      { 2239 }
   "LABLAXIS"  CDF_CHAR      { "CRN" }
   "UNITS"     CDF_CHAR      { " " }
   "FORMAT"    CDF_CHAR      { "I4" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_INT4      { -2147483648 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
```

Table 3–10. ISTP Orbit CDF (11 of 12)

```
!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "LONG_EARTH"   CDF_REAL8             1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Heliographic Long of the Earth" }
   "VALIDMIN"  CDF_REAL8     { 0.0 }
   "VALIDMAX"  CDF_REAL8     { 6.283185307 }
   "SCALEMIN"  CDF_REAL8     { 0.0 }
   "SCALEMAX"  CDF_REAL8     { 6.283185307 }
   "LABLAXIS"  CDF_CHAR      { "Helio Long" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "LAT_EARTH"   CDF_REAL8             1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Heliographic Lat of the Earth" }
   "VALIDMIN"  CDF_REAL8     { -1.570796327 }
   "VALIDMAX"  CDF_REAL8     { 1.570796327 }
   "SCALEMIN"  CDF_REAL8     { -1.570796327 }
   "SCALEMAX"  CDF_REAL8     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "Helio Lat" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "LONG_SPACE"   CDF_REAL8             1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Heliographic Long of Craft" }
```

Table 3–10. ISTP Orbit CDF (12 of 12)

```
   "VALIDMIN"  CDF_REAL8     { 0.0 }
   "VALIDMAX"  CDF_REAL8     { 6.283185307 }
   "SCALEMIN"  CDF_REAL8     { 0.0 }
   "SCALEMAX"  CDF_REAL8     { 6.283185307 }
   "LABLAXIS"  CDF_CHAR      { "Helio Long" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "LAT_SPACE"   CDF_REAL8             1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Heliographic Lat of the Craft" }
   "VALIDMIN"  CDF_REAL8     { -1.570796327 }
   "VALIDMAX"  CDF_REAL8     { 1.570796327 }
   "SCALEMIN"  CDF_REAL8     { -1.570796327 }
   "SCALEMAX"  CDF_REAL8     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "Helio Lat" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
#end
```

Table 3-10a. POLAR Orbit Variables (1 of 4)

```
!----------------------------------------------------------------
! Variable        Data         Number        Record       Dim
! Name            Type         Elements      Variance     Variance
!---------        ----         --------      --------     --------
 "EDMLT_TIME"     CDF_REAL4       1             T            F

! Attribute       Data          Value
! Name            Type
! ---------       ----          -----
  "FIELDNAM"      CDF_CHAR     { "Calculated EDMLT Time" }
  "VALIDMIN"      CDF_REAL4    { 0.0 }
  "VALIDMAX"      CDF_REAL4    { 24.0 }
  "SCALEMIN"      CDF_REAL4    { 0.0 }
```

Table 3-10a. POLAR Orbit Variables (2 of 4)

```
  "SCALEMAX"      CDF_REAL4     { 24.0 }
  "LABLAXIS"      CDF_CHAR      { "CALC EDMLT" }
  "UNITS"         CDF_CHAR      { "HOUR" }
  "FORMAT"        CDF_CHAR      { "F8.4" }
  "DEPEND_0"      CDF_CHAR      { "Epoch" }
  "FILLVAL"       CDF_REAL8     { -1.0E31 }
  "VAR_TYPE"      CDF_CHAR      { "data" }
  "DICT_KEY"      CDF_CHAR      { " " }.

!-----------------------------------------------------------------
! Variable        Data          Number        Record        Dim
! Name            Type          Elements      Variance      Variance
!---------        ----          --------      --------      --------
 "MAG_LATITUDE"   CDF_REAL4       1              T             F

! Attribute       Data           Value
! Name            Type
! ---------       ----           -----
  "FIELDNAM"      CDF_CHAR      { "MAGNETIC LATITUDE" }
  "VALIDMIN"      CDF_REAL4     { -90.0 }
  "VALIDMAX"      CDF_REAL4     { 90.0 }
  "SCALEMIN"      CDF_REAL4     { -90.0 }
  "SCALEMAX"      CDF_REAL4     { 90.0 }
  "LABLAXIS"      CDF_CHAR      { "MAG LAT" }
  "UNITS"         CDF_CHAR      { "DEG" }
  "FORMAT"        CDF_CHAR      { "F8.4" }
  "DEPEND_0"      CDF_CHAR      { "Epoch" }
  "FILLVAL"       CDF_REAL8     { -1.0E31 }
  "VAR_TYPE"      CDF_CHAR      { "data" }
  "DICT_KEY"      CDF_CHAR      { " " }.

!-----------------------------------------------------------------
! Variable        Data          Number        Record        Dim
! Name            Type          Elements      Variance      Variance
!---------        ----          --------      --------      --------
 "L_SHELL"        CDF_REAL4       1              T             F

! Attribute       Data           Value
! Name            Type
! ---------       ----           -----
  "FIELDNAM"      CDF_CHAR      { "L_SHELL" }
  "VALIDMIN"      CDF_REAL4     { 1.0 }
  "VALIDMAX"      CDF_REAL4     { 20000.0 }
  "SCALEMIN"      CDF_REAL4     { 1.0 }
  "SCALEMAX"      CDF_REAL4     { 20000.0 }
  "LABLAXIS"      CDF_CHAR      { "L_SHELL" }
  "UNITS"         CDF_CHAR      { "EARTH RADI" }
  "FORMAT"        CDF_CHAR      { "F11.4" }
  "DEPEND_0"      CDF_CHAR      { "Epoch" }
  "FILLVAL"       CDF_REAL8     { -1.0E31 }
```

Table 3-10a. POLAR Orbit Variables (3 of 4)

```
  "VAR_TYPE"      CDF_CHAR     { "data" }
  "DICT_KEY"      CDF_CHAR     { " " }.

!----------------------------------------------------------------
! Variable        Data         Number        Record       Dim
! Name            Type         Elements      Variance     Variance
!---------        ----         --------      --------     --------
 "ORB_REV_NUM"  CDF_INT            1             T            F

! Attribute       Data          Value
! Name            Type
! ---------       ----          -----
  "FIELDNAM"      CDF_CHAR     { "Orbit Revolution No." }
  "VALIDMIN"      CDF_INT4     { 0 }
  "VALIDMAX"      CDF_INT4     { 5000 }
  "SCALEMIN"      CDF_INT4     { 0 }
  "SCALEMAX"      CDF_INT4     { 5000 }
  "LABLAXIS"      CDF_CHAR     { "Orb Rev" }
  "UNITS"         CDF_CHAR     { " " }
  "FORMATS"       CDF_CHAR     { "I5" }
  "MONOTON"       CDF_CHAR     { " " }
  "DEPEND_0"      CDF_CHAR     { "Epoch" }
  "FILLVAL"       CDF_INT4     { -2147483648 }
  "VAR_TYPE"      CDF_CHAR     { "data" }.
  "DICT_KEY"      CDF_CHAR     { " " }

----------------------------------------------------------------
! Variable        Data         Number        Record       Dim
! Name            Type         Elements      Variance     Variance
!---------        ----         --------      --------     --------
 "NEXT_CROSS"   CDF_INT           1              T            F

! Attribute       Data          Value
! Name            Type
! ---------       ----          -----
  "FIELDNAM"      CDF_CHAR     { "Next Orbit Crossing" }
  "VALIDMIN"      CDF_INT4     { 0 }
  "VALIDMAX"      CDF_INT4     { 100 }
  "SCALEMIN"      CDF_INT4     { 0 }
  "SCALEMAX"      CDF_INT4     { 100 }
  "LABLAXIS"      CDF_CHAR     { "Next Cross" }
  "UNITS"         CDF_CHAR     { " " }
  "FORMATS"       CDF_CHAR     { "I5" }
  "MONOTON"       CDF_CHAR     { " " }
  "DEPEND_0"      CDF_CHAR     { "Epoch" }
  "FILLVAL"       CDF_INT4     { -2147483648 }
  "VAR_TYPE"      CDF_CHAR     { "data" }.
  "DICT_KEY"      CDF_CHAR     { " " }
```

Table 3-10a. POLAR Orbit Variables (4 of 4)

```
----------------------------------------------------------------
! Variable        Data          Number        Record       Dim
! Name            Type          Elements      Variance     Variance
!---------        ----          --------      --------     --------
 "ORB_CROSSING  CDF_INT            1             T            F
  TIME"

! Attribute       Data           Value
! Name            Type
! ---------       ----           -----
  "FIELDNAM"      CDF_CHAR      { "Crossing Time" }
  "VALIDMIN"      CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
  "VALIDMAX"      CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
  "SCALEMIN"      CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
  "SCALEMAX"      CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
  "LABLAXIS"      CDF_CHAR      { "Epoch" }
  "UNITS"         CDF_CHAR      { "ms" }
  "FORMATS"       CDF_CHAR      { "F8.4" }
  "MONOTON"       CDF_CHAR      { "INCREASE" }
  "DEPEND_O"      CDF_CHAR      { "Epoch" }
  "FILLVAL"       CDF_INT4      { -1.0E31 }
  "VAR_TYPE"      CDF_CHAR      { "data" }.
  "DICT_KEY:      CDF_CHAR      { " " }

----------------------------------------------------------------
#end
```

Note: The information in Table 3-10a becomes effective with the CDHF Release 6.2F software.

The data records referenced in the linked list have additional information related to the node crossing: orbit rev number, time of node crossing, and record number of next crossing. If the record number is zero, then the linked list is terminated.

Listed below are the gAttributes for accessing the linked list:

attribute_name	purpose
FIRST_CROSSING	Record number for first node crossing in the file
LAST_CROSSING	Record number for last node crossing in the file
NUM_CROSSING	Number of node crossings in the file
INIT_ORB_REV	Orbit rev number for first node crossing in the file
LAST_ORB_REV	Orbit rev number for last node crossing in the file

Listed below are the rVariables associated with node crossing:

variable_name	purpose
ORB_REV_NUM	Orbit rev number
ORB_CROSSING_TIME	Epoch of node crossing
NEXT_CROSS	Record number for next node crossing in the file

3.7 Attitude Formats

ISTP attitude files are provided in CDF. Refer to Reference 3 for information on extracting attitude data from the CDF. The CDF skeleton table for GEOTAIL, WIND, and POLAR spin-stablized attitude data is presented in Table 3–11. The CDF skeleton table for SOHO attitude data is shown in Table 3–12, and the CDF skeleton table for POLAR despun attitude data is shown in Table 3–13.

Table 3–11. ISTP GEOTAIL, WIND, and POLAR Attitude Spin-Stabilized CDF (1 of 7)

```
#header

!       SKELETON TABLE FOR THE ISTP ATTITUDE SPIN-STABILIZED CDF

               CDF NAME : istp_attitude_spin_stabilized
               DATA ENCODING : NETWORK
               MAJORITY : COLUMN
               FORMAT : SINGLE

! Variables  G. Attributes   V.Attributes  Records  Dims  Sizes
! ---------  -------------   ------------- -------  ---   -----
     12           19              17          0      1      3

!-------------------------------------------------------------
#GLOBALattributes

! Attribute                Entry   Data       Value
! Name                     Number  Type
! ---------                ------  ----       -----
  "TITLE"                     1:    CDF_CHAR   {"ISTP attitude " -
                                                "spin-stabilized CDF"}.
  "Project"                   1:    CDF_CHAR   {"ISTP>International " -
                                                "Solar-Terrestrial Physics"}.
  "Discipline"                1:    CDF_CHAR   {"Space Physics"}.
  "Source_name"               1:    CDF_CHAR   {" "}.
  "Data_version"              1:    CDF_CHAR   {" "}.
  "MESSAGE_ID"                1:    CDF_CHAR   {"       "}.
  "SUPPORT_ID"                1:    CDF_CHAR   {"    "}.
  "ADID_ref"                  1:    CDF_CHAR   {"NSSD0093"}.
  "Logical_file_id"           1:    CDF_CHAR   {"                        "}.
  "Data_type"                 1:    CDF_CHAR   {"AT>Attitude"}.
  "Descriptor"                1:    CDF_CHAR   {" "}.
  "STABILIZATION_TYPE"        1:    CDF_CHAR   {" "}.
  "START_DATE"                1:    CDF_CHAR   {"                          "}.
  "END_DATE"                  1:    CDF_CHAR   {"                          "}.
  "STEP_SIZE"                 1:    CDF_CHAR   {"       "}.
  "GCI_RA_ERR"                1:    CDF_CHAR   {" "}.
  "GCI_DECL_ERR"              1:    CDF_CHAR   {" "}.
  "TEXT"                      1:    CDF_CHAR   {"TBS"}.
  "MODS"                      1:    CDF_CHAR   {"6/13/91 - Original " -
                                                "Implementation"}
                              2:    CDF_CHAR   {"9/18/91 - Modified for new " -
                                                "attitude file format changes." -
```

Table 3–11. ISTP GEOTAIL, WIND, and POLAR Attitude Spin-Stabilized CDF (2 of 7)

```
                                    "  ICCR 881"}
                        3:    CDF_CHAR   {"2/11/92 - Used the variable " -
                                          "name TIME and type CDF_INT4 " -
                                          "and size 3 instead of "}
                        4:    CDF_CHAR   {"EPOCH, CDF_EPOCH and 1 for " -
                                          "the time tags.  CCR 490"}
                        5:    CDF_CHAR   {"6/1/92 - Added global " -
                                          "attributes TITLE, PROJECT, " -
                                          "DISCIPLINE, SOURCE_NAME, "}
                        6:    CDF_CHAR   {"DATA_VERSION, and MODS; " -
                                          "added variable attributes " -
                                          "VALIDMIN, VALIDMAX, "}
                        7:    CDF_CHAR   {"LABL_PTR_1, and MONOTON; " -
                                          "added variables EPOCH and " -
                                          "LABEL_TIME; "}
                        8:    CDF_CHAR   {"changed variable name TIME " -
                                          "to TIME_PB5.  CCR 1066"}
                        9:    CDF_CHAR   {"11/07/92 - use cdf variable " -
                                          "Epoch and Time_PB5"}
                       10:    CDF_CHAR   {"6/8/93 - Added global " -
                                          "attributes ADID_ref and " -
                                          "Logical_file_id.  CCR 1092"}
                       11:    CDF_CHAR   {"7/5/94 - CCR ISTP 1852, " -
                                          "updated CDHF skeleton to " -
                                          "CDF standards - JT"}
                       12:    CDF_CHAR   {"9/20/94 - Added global " -
                                          "attributes GCI_RA_ERR and " -
                                          "GCI_DECL_ERR.  CCR 1932"}
                       13:    CDF_CHAR   {"11/7/94 - Merged CCR 1852 " -
                                          "changes and corrected errors "}
                       14:    CDF_CHAR   {"made in CCR 1852.  ICCR 1884"}
                       15:    CDF_CHAR   {"12/7/94 - Modified MODS and " -
                                          "LABLAXIS to follow ISTP " -
                                          "standards.  ICCR 1885"}.
!-------------------------------------------------------------
#VARIABLEattributes

   "FIELDNAM"
   "VALIDMIN"
   "VALIDMAX"
   "SCALEMIN"
   "SCALEMAX"
   "LABLAXIS"
   "UNITS"
   "FORMAT"
   "LABL_PTR_1"
   "UNIT_PTR"
   "FORM_PTR"
   "MONOTON"
   "DEPEND_0"
   "DEPEND_1"
   "FILLVAL"
```

```
   "VAR_TYPE"
   "DICT_KEY"

!--------------------------------------------------------------
#variables

!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "Epoch"          CDF_EPOCH           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Attitude EPOCH time" }
   "VALIDMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "VALIDMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "SCALEMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "SCALEMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "LABLAXIS"  CDF_CHAR      { "Epoch" }
   "UNITS"     CDF_CHAR      { "ms" }
   "MONOTON"   CDF_CHAR      { "INCREASE" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!--------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "Time_PB5"       CDF_INT4           1          T            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Attitude PB5 time" }
   "VALIDMIN"   CDF_INT4      { 1992, 183, 0 }
   "VALIDMAX"   CDF_INT4      { 2020, 366, 86399000 }
   "SCALEMIN"   CDF_INT4      { 1992, 183, 0 }
   "SCALEMAX"   CDF_INT4      { 2020, 366, 86399000 }
   "LABL_PTR_1" CDF_CHAR      { "label_time" }
   "UNIT_PTR"   CDF_CHAR      { "unit_time" }
   "FORM_PTR"   CDF_CHAR      { "format_time" }
   "DEPEND_0"   CDF_CHAR      { "Epoch" }
   "DEPEND_1"   CDF_CHAR      { "unit_time" }
   "FILLVAL"    CDF_INT4      { -2147483648 }
   "VAR_TYPE"   CDF_CHAR      { "data" }
   "DICT_KEY"   CDF_CHAR      { " " }.
```

Table 3–11. ISTP GEOTAIL, WIND, and POLAR Attitude Spin-Stabilized CDF (4 of 7)

```
!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "label_time"     CDF_CHAR            27         F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Label for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.
     [1] = { "Year                     " }
     [2] = { "Day of Year (Jan 1 = day 1)" }
     [3] = { "Elapsed ms of Day         " }

!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "unit_time"     CDF_CHAR              4         F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Units for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

     [1] = { "year" }
     [2] = { "day " }
     [3] = { "msec" }

!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "format_time"    CDF_CHAR             2         F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Formats for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

     [1] = { "I4" }
     [2] = { "I3" }
     [3] = { "I8" }
```

Table 3–11. ISTP GEOTAIL, WIND, and POLAR Attitude Spin-Stabilized CDF (5 of 7)

```
!------------------------------------------------------------
!   Variable          Data             Number     Record       Dim
!   Name              Type             Elements   Variance     Variance
!   --------          ----             --------   --------     --------
    "BODY_SPIN_RATE"  CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Body spin rate" }
   "VALIDMIN"  CDF_REAL4     { 0.0 }
   "VALIDMAX"  CDF_REAL4     { 100.0 }
   "SCALEMIN"  CDF_REAL4     { 0.0 }
   "SCALEMAX"  CDF_REAL4     { 100.0 }
   "LABLAXIS"  CDF_CHAR      { "Spin Rate" }
   "UNITS"     CDF_CHAR      { "rpm" }
   "FORMAT"    CDF_CHAR      { "F9.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "GCI_R_ASCENSION"  CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI right ascension" }
   "VALIDMIN"  CDF_REAL4     { 0.0 }
   "VALIDMAX"  CDF_REAL4     { 6.283185307 }
   "SCALEMIN"  CDF_REAL4     { 0.0 }
   "SCALEMAX"  CDF_REAL4     { 6.283185307 }
   "LABLAXIS"  CDF_CHAR      { "GCI R Ascn" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "GCI_DECLINATION"  CDF_REAL4           1          T            F
```

Table 3–11. ISTP GEOTAIL, WIND, and POLAR Attitude Spin-Stabilized CDF (6 of 7)

```
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI declination" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "GCI Decli" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "GSE_R_ASCENSION"  CDF_REAL4            1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE right ascension" }
   "VALIDMIN"  CDF_REAL4     { 0.0 }
   "VALIDMAX"  CDF_REAL4     { 6.283185307 }
   "SCALEMIN"  CDF_REAL4     { 0.0 }
   "SCALEMAX"  CDF_REAL4     { 6.283185307 }
   "LABLAXIS"  CDF_CHAR      { "GSE R Ascn" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "GSE_DECLINATION"  CDF_REAL4            1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE declination" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "GSE Decli" }
```

Table 3–11. ISTP GEOTAIL, WIND, and POLAR Attitude Spin-Stabilized CDF (7 of 7)

```
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
!-------------------------------------------------------------
!   Variable           Data             Number     Record      Dim
!   Name               Type             Elements   Variance    Variance
!   --------           ----             --------   --------    --------
    "GSM_R_ASCENSION"  CDF_REAL4           1          T            F
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM right ascension" }
   "VALIDMIN"  CDF_REAL4     { 0.0 }
   "VALIDMAX"  CDF_REAL4     { 6.283185307 }
   "SCALEMIN"  CDF_REAL4     { 0.0 }
   "SCALEMAX"  CDF_REAL4     { 6.283185307 }
   "LABLAXIS"  CDF_CHAR      { "GSM R Ascn" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record      Dim
!   Name               Type             Elements   Variance    Variance
!   -------            ----             --------   --------    --------
    "GSM_DECLINATION"  CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM declination" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "GSM Decli" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F7.3" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
#end
```

Table 3–12. ISTP SOHO Attitude CDF (1 of 13)

```
#header

!       SKELETON TABLE FOR THE ISTP SOHO ATTITUDE CDF

               CDF NAME : istp_soho_attitude
               DATA ENCODING : NETWORK
               MAJORITY : COLUMN
               FORMAT : SINGLE

! Variables  G. Attributes   V.Attributes  Records  Dims  Sizes
! ---------  -------------   ------------- -------  ---   -----
     26          14             17          0      1      3

!-------------------------------------------------------------
#GLOBALattributes

! Attribute              Entry   Data       Value
! Name                   Number  Type
! ---------              ------  ----       -----
  "TITLE"                   1:    CDF_CHAR  {"ISTP SOHO 3-axis stabilized " -
                                             "attitude CDF"}.
  "Project"                 1:    CDF_CHAR  {"ISTP>International " -
                                             "Solar-Terrestrial Physics"}.
  "Discipline"              1:    CDF_CHAR  {"Space Physics"}.
  "Source_name"             1:    CDF_CHAR  {"SOHO>Solar Heliospheric " -
                                             "Observatory"}.
  "Data_type"               1:    CDF_CHAR  {"AT>Attitude"}.
  "Descriptor"              1:    CDF_CHAR  {"DEF>Definitive data"}.
  "Data_version"            1:    CDF_CHAR  {" "}.
  "TEXT"                    1:    CDF_CHAR  {"Data: 10 minute intervals"}.
  "STABILIZATION_TYPE"      1:    CDF_CHAR  {"A"}.
  "START_DATE"              1:    CDF_CHAR  {"                         "}.
  "END_DATE"                1:    CDF_CHAR  {"                         "}.
  "ADID_ref"                1:    CDF_CHAR  {"NSSD0208"}.
  "Logical_file_id"         1:    CDF_CHAR  {"                       "}.
  "MODS"                    1:    CDF_CHAR  {"5/6/94 - Original " -
                                             "Implementation"}.

!-------------------------------------------------------------
#VARIABLEattributes

   "FIELDNAM"
   "VALIDMIN"
   "VALIDMAX"
   "SCALEMIN"
   "SCALEMAX"
   "LABLAXIS"
   "UNITS"
   "FORMAT"
   "MONOTON"
   "LABL_PTR_1"
   "UNIT_PTR"
   "FORM_PTR"
   "DEPEND_0"
```

```
   "DEPEND_1"
   "FILLVAL"
   "VAR_TYPE"
   "DICT_KEY"

!-------------------------------------------------------------
#variables

!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "Epoch"          CDF_EPOCH          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "SOHO attitude EPOCH time" }
   "VALIDMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "VALIDMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "SCALEMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "SCALEMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "LABLAXIS"  CDF_CHAR      { "Epoch" }
   "UNITS"     CDF_CHAR      { "ms" }
   "MONOTON"   CDF_CHAR      { "INCREASE" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "Time_PB5"       CDF_INT4           1          T            T

!  Attribute     Data          Value
!  Name          Type
!-----------     -----         ------
   "FIELDNAM"    CDF_CHAR      { "SOHO attitude PB5 time" }
   "VALIDMIN"    CDF_INT4      { 1992, 183, 0 }
   "VALIDMAX"    CDF_INT4      { 2020, 366, 86399000 }
   "SCALEMIN"    CDF_INT4      { 1992, 183, 0 }
   "SCALEMAX"    CDF_INT4      { 2020, 366, 86399000 }
   "LABL_PTR_1"  CDF_CHAR      { "label_time" }
   "UNIT_PTR"    CDF_CHAR      { "unit_time" }
   "FORM_PTR"    CDF_CHAR      { "format_time" }
   "DEPEND_0"    CDF_CHAR      { "Epoch" }
   "DEPEND_1"    CDF_CHAR      { "unit_time" }
   "FILLVAL"     CDF_INT4      { -2147483648 }
   "VAR_TYPE"    CDF_CHAR      { "data" }
   "DICT_KEY"    CDF_CHAR      { " " }.

!-------------------------------------------------------------
```

Table 3–12. ISTP SOHO Attitude CDF (3 of 13)

```
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "label_time"     CDF_CHAR           27          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Label for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

     [1] = { "Year                         " }
     [2] = { "Day of Year (Jan 1 = day 1)" }
     [3] = { "Elapsed ms of Day           " }

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "unit_time"      CDF_CHAR            4          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Units for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

     [1] = { "year" }
     [2] = { "day " }
     [3] = { "msec" }

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "format_time"    CDF_CHAR            2          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Format for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

     [1] = { "I4" }
     [2] = { "I3" }
     [3] = { "I8" }
```

Table 3–12. ISTP SOHO Attitude CDF (4 of 13)

```
!------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "SAT_PITCH_AVG"    CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C body axis avg pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "Sat p avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "SAT_ROLL_AVG"     CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C body axis avg roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "Sat r avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "SAT_YAW_AVG"      CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C body axis avg yaw angle" }
```

```
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "Sat y avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!--------------------------------------------------------------
!   Variable           Data            Number     Record      Dim
!   Name               Type            Elements   Variance    Variance
!   --------           ----            --------   --------    --------
    "SAR_PITCH_AVG"   CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Solar axis refer avg pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "Sar r avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!--------------------------------------------------------------
!   Variable           Data            Number     Record      Dim
!   Name               Type            Elements   Variance    Variance
!   --------           ----            --------   --------    --------
    "SAR_ROLL_AVG"    CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Solar axis refer avg roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GCI p avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
```

Table 3–12. ISTP SOHO Attitude CDF (6 of 13)

```
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable           Data            Number     Record       Dim
!   Name               Type            Elements   Variance     Variance
!   --------           ----            --------   --------     --------
    "GCI_PITCH_AVG"    CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI average pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GCI p avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable           Data            Number     Record       Dim
!   Name               Type            Elements   Variance     Variance
!   -------            ----            --------   --------     --------
    "GCI_ROLL_AVG"     CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI average roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GCI r avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable           Data            Number     Record       Dim
!   Name               Type            Elements   Variance     Variance
!   -------            ----            --------   --------     --------
    "GCI_YAW_AVG"      CDF_REAL4          1          T            F
```

Table 3–12. ISTP SOHO Attitude CDF (7 of 13)

```
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI average yaw angle" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "GCI y avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable          Data            Number     Record       Dim
!   Name              Type            Elements   Variance     Variance
!   --------          ----            --------   --------     --------
    "GSE_PITCH_AVG"   CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE average pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GSE p avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable          Data            Number     Record       Dim
!   Name              Type            Elements   Variance     Variance
!   -------           ----            --------   --------     --------
    "GSE_ROLL_AVG"    CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE average roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GSE r avg" }
   "UNITS"     CDF_CHAR      { "rad" }
```

Table 3–12. ISTP SOHO Attitude CDF (8 of 13)

```
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "GSE_YAW_AVG"      CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE average yaw angle" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "GSE y avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "GSM_PITCH_AVG"    CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM average pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GSM p avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
```

Table 3–12. ISTP SOHO Attitude CDF (9 of 13)

```
!------------------------------------------------------------
!   Variable          Data            Number     Record       Dim
!   Name              Type            Elements   Variance     Variance
!   -------           ----            --------   --------     --------
    "GSM_ROLL_AVG"    CDF_REAL4          1          T            F
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM average roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GSM r avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable          Data            Number     Record       Dim
!   Name              Type            Elements   Variance     Variance
!   --------          ----            --------   --------     --------
    "GSM_YAW_AVG"     CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM average yaw angle" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "GSM y avg" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable          Data            Number     Record       Dim
!   Name              Type            Elements   Variance     Variance
!   --------          ----            --------   --------     --------
    "SAT_PITCH_STDDEV" CDF_REAL4         1          T            F

!  Attribute   Data        Value
!  Name        Type
!-----------   -----       ------
   "FIELDNAM"  CDF_CHAR    { "S/C axis std dev of pitch ang" }
   "VALIDMIN"  CDF_REAL4   { -3.141592654 }
```

Table 3–12. ISTP SOHO Attitude CDF (10 of 13)

```
   "VALIDMAX"  CDF_REAL4    { 3.141592654 }
   "SCALEMIN"  CDF_REAL4    { -3.141592654 }
   "SCALEMAX"  CDF_REAL4    { 3.141592654 }
   "LABLAXIS"  CDF_CHAR     { "Sat p stdv" }
   "UNITS"     CDF_CHAR     { "rad" }
   "FORMAT"    CDF_CHAR     { "F9.5" }
   "DEPEND_0"  CDF_CHAR     { "Epoch" }
   "FILLVAL"   CDF_REAL4    { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR     { "data" }
   "DICT_KEY"  CDF_CHAR     { " " }.

!-------------------------------------------------------------
!   Variable            Data            Number     Record       Dim
!   Name                Type            Elements   Variance     Variance
!   -------             ----            --------   --------     --------
    "SAT_ROLL_STDDEV"   CDF_REAL4          1          T            F

!  Attribute   Data         Value
!  Name        Type
!-----------   -----        ------
   "FIELDNAM"  CDF_CHAR     { "S/C axis std dev of roll ang" }
   "VALIDMIN"  CDF_REAL4    { -3.141592654 }
   "VALIDMAX"  CDF_REAL4    { 3.141592654 }
   "SCALEMIN"  CDF_REAL4    { -3.141592654 }
   "SCALEMAX"  CDF_REAL4    { 3.141592654 }
   "LABLAXIS"  CDF_CHAR     { "Sat r stdv" }
   "UNITS"     CDF_CHAR     { "rad" }
   "FORMAT"    CDF_CHAR     { "F9.5" }
   "DEPEND_0"  CDF_CHAR     { "Epoch" }
   "FILLVAL"   CDF_REAL4    { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR     { "data" }
   "DICT_KEY"  CDF_CHAR     { " " }.

!-------------------------------------------------------------
!   Variable            Data            Number     Record       Dim
!   Name                Type            Elements   Variance     Variance
!   -------             ----            --------   --------     --------
    "SAT_YAW_STDDEV"    CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C axis std dev of yaw ang" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "Sat r stdv" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
```

Table 3–12. ISTP SOHO Attitude CDF (11 of 13)

```
!---------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "SAT_PITCH_MIN"    CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C body axis min pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "Sat p min" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!---------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "SAT_ROLL_MIN"     CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C body axis min roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "Sat r min" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!---------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "SAT_YAW_MIN"      CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C body axis min yaw angle" }
```

Table 3–12. ISTP SOHO Attitude CDF (12 of 13)

```
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "Sat y min" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "SAT_PITCH_MAX"    CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C body axis max pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "Sat p max" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "SAT_ROLL_MAX"     CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C body axis max roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "Sat r max" }
   "UNITS"     CDF_CHAR      { "rad" }
```

```
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "SAT_YAW_MAX"      CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "S/C body axis max yaw angle" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "Sat y max" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
```

#end

Table 3–13. ISTP POLAR Despun Platform Attitude CDF (1 of 9)

```
#header

!       SKELETON TABLE FOR THE ISTP DESPUN PLATFORM ATTITUDE CDF

               CDF NAME : istp_despun_platform_attitude
               DATA ENCODING : NETWORK
               MAJORITY : COLUMN
               FORMAT : SINGLE

! Variables  G. Attributes   V.Attributes  Records  Dims  Sizes
! ---------  -------------   ------------- -------  ---   -----
     18          19              17          0      1      3

!-------------------------------------------------------------
#GLOBALattributes

! Attribute                Entry   Data       Value
! Name                     Number  Type
! ---------                ------  ----       -----
  "TITLE"                     1:    CDF_CHAR   {"ISTP despun platform " -
                                                "attitude CDF"}.
  "Project"                   1:    CDF_CHAR   {"ISTP>International " -
                                                "Solar-Terrestrial Physics"}.
  "Discipline"                1:    CDF_CHAR   {"Space Physics"}.
  "Source_name"               1:    CDF_CHAR   {"POLAR>Polar Plasma " -
                                                "Laboratory"}.
  "Data_version"              1:    CDF_CHAR   {" "}.
  "Data_type"                 1:    CDF_CHAR   {"PA>Platform Attitude"}.
  "Descriptor"                1:    CDF_CHAR   {"DEF>Definitive data"}.
  "STABILIZATION_TYPE"        1:    CDF_CHAR   {"D"}.
  "ROTATION_SEQUENCE"         1:    CDF_CHAR   {"ZYZ"}.
  "MISALIGN_ANG_1"            1:    CDF_CHAR   {" "}.
  "MISALIGN_ANG_2"            1:    CDF_CHAR   {" "}.
  "MISALIGN_ANG_3"            1:    CDF_CHAR   {" "}.
  "START_DATE"                1:    CDF_CHAR   {"                        "}.
  "END_DATE"                  1:    CDF_CHAR   {"                        "}.
  "STEP_SIZE"                 1:    CDF_CHAR   {" "}.
  "ADID_ref"                  1:    CDF_CHAR   {"NSSD0156"}.
  "Logical_file_id"           1:    CDF_CHAR   {"                      "}.
  "TEXT"                      1:    CDF_CHAR   {"Based on the FDF DPA " -
                                                "algorithm"}.
  "MODS"                      1:    CDF_CHAR   {"6/11/93 - Original " -
                                                "Implementation"}
                              2:    CDF_CHAR   {"4/1/94 - Modified VALIDMIN " -
                                                "and VALIDMAX for ORB_ROLL, "}
                              3:    CDF_CHAR   {"ORB_YAW, GCI_ROLL, GCI_YAW, " -
                                                "GSE_ROLL, GSE_YAW, GSM_ROLL, " -
                                                "and GSM_YAW"}
                              4:    CDF_CHAR   {"6/7/94 - CCR ISTP 1852, " -
                                                "updated CDHF skeleton to " -
                                                "CDF standards - JT"}
                              5:    CDF_CHAR   {"11/9/94 - Correct errors " -
                                                "made in ccr 1852.  ICCR 1884"}.
```

Table 3–13. ISTP POLAR Despun Platform Attitude CDF (2 of 9)

```
!------------------------------------------------------------
#VARIABLEattributes

   "FIELDNAM"
   "VALIDMIN"
   "VALIDMAX"
   "SCALEMIN"
   "SCALEMAX"
   "LABLAXIS"
   "UNITS"
   "FORMAT"
   "LABL_PTR_1"
   "UNIT_PTR"
   "FORM_PTR"
   "MONOTON"
   "DEPEND_0"
   "DEPEND_1"
   "FILLVAL"
   "VAR_TYPE"
   "DICT_KEY"

!------------------------------------------------------------
#variables

!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "Epoch"          CDF_EPOCH           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "DP attitude EPOCH time" }
   "VALIDMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "VALIDMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "SCALEMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "SCALEMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "LABLAXIS"  CDF_CHAR      { "Epoch" }
   "UNITS"     CDF_CHAR      { "ms" }
   "MONOTON"   CDF_CHAR      { "INCREASE" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "Time_PB5"       CDF_INT4            1          T            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "DP attitude PB5 time" }
```

Table 3–13. ISTP POLAR Despun Platform Attitude CDF (3 of 9)

```
   "SCALEMIN"   CDF_INT4      { 1992, 183, 0 }
   "SCALEMAX"   CDF_INT4      { 2020, 366, 86399000 }
   "LABL_PTR_1" CDF_CHAR      { "label_time" }
   "UNIT_PTR"   CDF_CHAR      { "unit_time" }
   "FORM_PTR"   CDF_CHAR      { "format_time" }
   "DEPEND_0"   CDF_CHAR      { "Epoch" }
   "DEPEND_1"   CDF_CHAR      { "unit_time" }
   "FILLVAL"    CDF_INT4      { -2147483648 }
   "VAR_TYPE"   CDF_CHAR      { "data" }
   "DICT_KEY"   CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "label_time"     CDF_CHAR           27         F            T

!  Attribute    Data          Value
!  Name         Type
   "VALIDMIN"   CDF_INT4      { 1992, 183, 0 }
   "VALIDMAX"   CDF_INT4      { 2020, 366, 86399000 }
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Label for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

     [1] = { "Year                       " }
     [2] = { "Day of Year (Jan 1 = day 1)" }
     [3] = { "Elapsed ms of Day          " }

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "unit_time"      CDF_CHAR            4         F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Units for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

     [1] = { "year" }
     [2] = { "day " }
     [3] = { "msec" }

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "format_time"    CDF_CHAR            2         F            T
```

Table 3–13. ISTP POLAR Despun Platform Attitude CDF (4 of 9)

```
!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Formats for Time_PB5" }
   "VAR_TYPE"   CDF_CHAR      { "metadata" }
   "DICT_KEY"   CDF_CHAR      { " " }.

     [1] = { "I4" }
     [2] = { "I3" }
     [3] = { "I8" }

!-------------------------------------------------------------
!   Variable          Data             Number     Record       Dim
!   Name              Type             Elements   Variance     Variance
!   --------          ----             --------   --------     --------
    "ORB_PITCH"       CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Orbital pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }

   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "Orb Pitch" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " "}.

!-------------------------------------------------------------
!   Variable          Data             Number     Record       Dim
!   Name              Type             Elements   Variance     Variance
!   -------           ----             --------   --------     --------
    "ORB_ROLL"        CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Orbital roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "Orb Roll" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
```

```
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable          Data             Number     Record       Dim
!   Name              Type             Elements   Variance     Variance
!   -------           ----             --------   --------     --------
    "ORB_YAW"         CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Orbital yaw angle" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "Orb Yaw" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
!------------------------------------------------------------
!   Variable          Data             Number     Record       Dim
!   Name              Type             Elements   Variance     Variance
!   --------          ----             --------   --------     --------
    "GCI_PITCH"       CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GCI Pitch" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable          Data             Number     Record       Dim
!   Name              Type             Elements   Variance     Variance
!   -------           ----             --------   --------     --------
    "GCI_ROLL"        CDF_REAL4           1          T            F
```

Table 3–13. ISTP POLAR Despun Platform Attitude CDF (6 of 9)

```
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GCI Roll" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "GCI_YAW"          CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GCI yaw angle" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "GCI Yaw" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "GSE_PITCH"        CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GSE Pitch" }
   "UNITS"     CDF_CHAR      { "rad" }
```

Table 3–13. ISTP POLAR Despun Platform Attitude CDF (7 of 9)

```
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "GSE_ROLL"         CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GSE Roll" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "GSE_YAW"          CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSE yaw angle" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "GSE Yaw" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
```

Table 3–13. ISTP POLAR Despun Platform Attitude CDF (8 of 9)

```
!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "GSM_PITCH"        CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM pitch angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GSM Pitch" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   -------            ----             --------   --------     --------
    "GSM_ROLL"         CDF_REAL4          1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM roll angle" }
   "VALIDMIN"  CDF_REAL4     { -3.141592654 }
   "VALIDMAX"  CDF_REAL4     { 3.141592654 }
   "SCALEMIN"  CDF_REAL4     { -3.141592654 }
   "SCALEMAX"  CDF_REAL4     { 3.141592654 }
   "LABLAXIS"  CDF_CHAR      { "GSM Roll" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "GSM_YAW"          CDF_REAL4          1          T            F
```

Table 3–13. ISTP POLAR Despun Platform Attitude CDF (9 of 9)

```
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "GSM yaw angle" }
   "VALIDMIN"  CDF_REAL4     { -1.570796327 }
   "VALIDMAX"  CDF_REAL4     { 1.570796327 }
   "SCALEMIN"  CDF_REAL4     { -1.570796327 }
   "SCALEMAX"  CDF_REAL4     { 1.570796327 }
   "LABLAXIS"  CDF_CHAR      { "GSM Yaw" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F9.5" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
  "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data            Number     Record       Dim
!   Name               Type            Elements   Variance     Variance
!   --------           ----            --------   --------     --------
    "DPA_INDICATOR"    CDF_INT4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "DPA accuracy indicator" }
   "VALIDMIN"  CDF_INT4      { 0 }
   "VALIDMAX"  CDF_INT4      { 1 }
   "SCALEMIN"  CDF_INT4      { 0 }
   "SCALEMAX"  CDF_INT4      { 1 }
   "LABLAXIS"  CDF_CHAR      { "DPA Ind" }
   "UNITS"     CDF_CHAR      { " " }
   "FORMAT"    CDF_CHAR      { "I1" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }

   "FILLVAL"   CDF_INT4      { -2147483648 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
#end
```

3.8 SOHO Full-Time Resolution Attitude

In addition to the standard CDF attitude file, the CDHF will extract the full-time resolution data from the SOHO telemetry and create a new attitude file for distribution to the SOHO investigators. The roll angle data will be repeated to fill in to match the 10 values per second of pitch and yaw data. The full-time resolution file will contain IEEE records at 10 samples per second. As shown in Table 3–14 and 3-14a, the file will contain the following fields in spacecraft body-axis coordinates:

> Year, Day of Year, Millisecond of Day, Pitch Angle, Yaw Angle, Roll Angle, Sun Present Flag, and Validity Flag

The Sun present flag and the validity flag match the corresponding flags in the telemetry data stream. An example filename for a SOHO full-resolution file is as follows:

SO_AT_FTR_19940915_V01.TXT

Note that the file-naming convention is described in detail in Section 2.6.

Table 3–14. SOHO Full-Time Resolution Attitude Data Record Format

Field	Bytes	Type	Length	Description
1	0–3	Integer	4	Year
2	4–7	Integer	4	Day of Year

Table 3–14a. SOHO Full-Time Resolution Attitude Header Record Format

Field	Bytes	Type	Length	Description
1	0–3	Integer	4	Milliseconds of Day
2	4–7	Real	4	Pitch Angle (Degrees)
3	4–11	Real	4	Yaw Angle (Degrees)
4	12–15	Real	4	Roll Angle (Degrees)
5	16–19	Integer	4	Data Flag: Sum of sun flag (0 = present, 1 = not present) times 10 + validity flag (0 = valid data, 1= invalid data)

3.9 GEOTAIL Spin-Phase Format

ISTP GEOTAIL spin-phase files are provided in CDF; Reference 3 provides information on extracting spin-phase data from CDF. Table 3–15 presents the CDF skeleton table for the GEOTAIL spin-phase data.

3.10 WIND and POLAR Spin-Phase Format

ISTP WIND and POLAR spin-phase files are provided in CDF; Reference 3 provides information on extracting spin-phase data from CDF. Table 3–16 presents the CDF skeleton table for the WIND and POLAR spin-phase data.

Table 3–15. ISTP GEOTAIL Spin-Phase CDF (1 of 4)

```
#header
!       SKELETON TABLE FOR THE ISTP GEOTAIL SPIN PHASE CDF
               CDF NAME : istp_geotail_spin_phase
               DATA ENCODING : NETWORK
               MAJORITY : COLUMN
               FORMAT : SINGLE
! Variables  G. Attributes   V.Attributes  Records  Dims  Sizes
! ---------  -------------   ------------  -------  ----  -----
      8           14             17           0       1     3
!---------------------------------------------------------------
#GLOBALattributes
! Attribute               Entry   Data       Value
! Name                    Number  Type
! ---------               ------  ----       -----
  "TITLE"                    1:    CDF_CHAR   {"ISTP GEOTAIL spin phase CDF"}.
  "Project"                  1:    CDF_CHAR   {"ISTP>International " -
                                               "Solar-Terrestrial Physics"}.
  "Discipline"               1:    CDF_CHAR   {"Space Physics"}.
  "Source_name"              1:    CDF_CHAR   {"GEOTAIL>Geomagnetic Tail"}.
  "Data_version"             1:    CDF_CHAR   {" "}.
  "Data_type"                1:    CDF_CHAR   {"K0>Key Parameter"}.
  "Descriptor"               1:    CDF_CHAR   {"SPHA>Spin Phase"}.
  "ADID_ref"                 1:    CDF_CHAR   {"NSSD0133"}.
  "Logical_file_id"          1:    CDF_CHAR   {"                       "}.
  "START_DATE"               1:    CDF_CHAR   {"                         "}.
  "END_DATE"                 1:    CDF_CHAR   {"                         "}.
  "STEP_SIZE"                1:    CDF_CHAR   {"60000"}.
  "TEXT"                     1:    CDF_CHAR   {"Geotail Prelaunch Report " -
                                               "April 1992"}.
  "MODS"                     1:    CDF_CHAR   {"4/6/92 - Original " -
                                               "Implementation, CCR 935"}
                             2:    CDF_CHAR   {"6/12/92 - Added global " -
                                               "attributes TITLE, PROJECT, "}
                             3:    CDF_CHAR   {"DISCIPLINE, SOURCE_NAME, " -
                                               "DATA_VERSION, and MODS;"}
                             4:    CDF_CHAR   {"added variable attributes " -
                                               "VALIDMIN, VALIDMAX, " -
                                               "LABL_PTR_1, and MONOTON;"}
                             5:    CDF_CHAR   {"added variables EPOCH and " -
                                               "LABEL_TIME; "}
                             6:    CDF_CHAR   {"changed variable name " -
                                               "TIME to TIME_PB5. CCR 935"}
                             7:    CDF_CHAR   {"9/23/92 - Changed descriptor" -
                                               " value from SPAH to SPHA. " -
                                               "ICCR 1387"}
                             8:    CDF_CHAR   {"2/22/93 - Changed VALIDMAX " -
                                               "of FAULT. CCR 1361"}
                             9:    CDF_CHAR   {"6/10/93 - Added ADID_ref " -
                                               "and Logical_file_id. " -
                                               "CCR 1092"}
                            10:    CDF_CHAR   {"6/14/94 - CCR ISTP 1852, " -
                                               "updated CDHF skeleton to " -
```

```
                                               "CDF standards - JT"}
                           11:    CDF_CHAR   {"11/9/94 - Correct errors " -
                                               "made in ccr 1852.  ICCR 1884"}.
!-------------------------------------------------------------
#VARIABLEattributes
   "FIELDNAM"
   "VALIDMIN"
   "VALIDMAX"
   "SCALEMIN"
   "SCALEMAX"
   "LABLAXIS"
   "UNITS"
   "FORMAT"
   "LABL_PTR_1"
   "UNIT_PTR"
   "FORM_PTR"
   "MONOTON"
   "DEPEND_0"
   "DEPEND_1"
   "FILLVAL"
   "VAR_TYPE"
   "DICT_KEY"
!-------------------------------------------------------------
#variables
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "Epoch"          CDF_EPOCH           1          T            F
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Spin phase EPOCH time" }
   "VALIDMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "VALIDMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "SCALEMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "SCALEMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "LABLAXIS"  CDF_CHAR      { "Epoch" }
   "UNITS"     CDF_CHAR      { "ms" }
   "MONOTON"   CDF_CHAR      { "INCREASE" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "Time_PB5"       CDF_INT4           1          T            T
!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"   CDF_CHAR      { "Spin phase PB5 time" }
   "VALIDMIN"   CDF_INT4      { 1992, 183, 0 }
   "VALIDMAX"   CDF_INT4      { 2020, 366, 86399000 }
   "SCALEMIN"   CDF_INT4      { 1992, 183, 0 }
   "SCALEMAX"   CDF_INT4      { 2020, 366, 86399000 }
   "LABL_PTR_1" CDF_CHAR      { "label_time" }
   "UNIT_PTR"   CDF_CHAR      { "unit_time" }
   "FORM_PTR"   CDF_CHAR      { "format_time" }
   "DEPEND_0"   CDF_CHAR      { "Epoch" }
   "DEPEND_1"   CDF_CHAR      { "unit_time" }
```

```
  "FILLVAL"    CDF_INT4      { -2147483648 }
  "VAR_TYPE"   CDF_CHAR      { "data" }
  "DICT_KEY"   CDF_CHAR      { " " }.
!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "label_time"     CDF_CHAR            27          F            T
!  Attribute     Data          Value
!  Name          Type
!-----------     -----         ------
  "FIELDNAM"   CDF_CHAR      { "Label for Time_PB5" }
  "VAR_TYPE"   CDF_CHAR      { "metadata" }
  "DICT_KEY"   CDF_CHAR      { " " }.
    [1] = { "Year                        " }
    [2] = { "Day of Year (Jan 1 = day 1)" }
    [3] = { "Elapsed ms of Day          " }
!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "unit_time"      CDF_CHAR             4          F            T
!  Attribute     Data          Value
!  Name          Type
!-----------     -----         ------
  "FIELDNAM"   CDF_CHAR      { "Units for Time_PB5" }
  "VAR_TYPE"   CDF_CHAR      { "metadata" }
  "DICT_KEY"   CDF_CHAR      { " " }.

    [1] = { "year" }
    [2] = { "day " }
    [3] = { "msec" }

!-------------------------------------------------------------
!   Variable         Data             Number     Record       Dim
!   Name             Type             Elements   Variance     Variance
!   -------          ----             --------   --------     --------
    "format_time"    CDF_CHAR             2          F            T

!  Attribute     Data          Value
!  Name          Type
!-----------     -----         ------
  "FIELDNAM"   CDF_CHAR      { "Formats for Time_PB5" }
  "VAR_TYPE"   CDF_CHAR      { "metadata" }
  "DICT_KEY"   CDF_CHAR      { " " }.
    [1] = { "I4" }
    [2] = { "I3" }
    [3] = { "I8" }
!-------------------------------------------------------------
!   Variable          Data             Number     Record       Dim
!   Name              Type             Elements   Variance     Variance
!   --------          ----             --------   --------     --------
    "SPIN_PHASE"      CDF_REAL4           1          T            F

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
  "FIELDNAM"  CDF_CHAR      { "Spin phase angle" }
  "VALIDMIN"  CDF_REAL4     { 0.0 }
```

Table 3–15. ISTP GEOTAIL Spin-Phase CDF (4 of 4)

```
   "VALIDMAX"  CDF_REAL4     { 6.283185307 }
   "SCALEMIN"  CDF_REAL4     { 0.0 }
   "SCALEMAX"  CDF_REAL4     { 6.283185307 }
   "LABLAXIS"  CDF_CHAR      { "SP Angle" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F12.8" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable          Data             Number     Record       Dim
!   Name              Type             Elements   Variance     Variance
!   --------          ----             --------   --------     --------
    "SPIN_RATE"       CDF_REAL4           1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Spin rate" }
   "VALIDMIN"  CDF_REAL4     { 0.0 }
   "VALIDMAX"  CDF_REAL4     { 6.283185307 }
   "SCALEMIN"  CDF_REAL4     { 0.0 }
   "SCALEMAX"  CDF_REAL4     { 6.283185307 }
   "LABLAXIS"  CDF_CHAR      { "Spin Rate" }
   "UNITS"     CDF_CHAR      { "rad/sec" }
   "FORMAT"    CDF_CHAR      { "F12.8" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------
!   Variable           Data             Number     Record       Dim
!   Name               Type             Elements   Variance     Variance
!   --------           ----             --------   --------     --------
    "FAULT"            CDF_INT4            1          T            F

!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Fault level status indicator" }
   "VALIDMIN"  CDF_INT4      { 0 }
   "VALIDMAX"  CDF_INT4      { 4 }
   "SCALEMIN"  CDF_INT4      { 0 }
   "SCALEMAX"  CDF_INT4      { 4 }
   "LABLAXIS"  CDF_CHAR      { "Stat Ind" }
   "UNITS"     CDF_CHAR      { " " }
   "FORMAT"    CDF_CHAR      { "I1" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_INT4      { -2147483648 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.

!-------------------------------------------------------------

#end
```

Table 3–16. ISTP WIND Spin-Phase CDF (1 of 4)

```
#header

!       SKELETON TABLE FOR THE ISTP WIND SPIN PHASE CDF

               CDF NAME : istp_wind_spin_phase
               DATA ENCODING : NETWORK
               MAJORITY : COLUMN
               FORMAT : SINGLE

! Variables  G. Attributes   V.Attributes  Records  Dims  Sizes
! ---------  -------------   ------------  -------  ----  -----
      9          13              17          0       1     3

!-------------------------------------------------------------
#GLOBALattributes

! Attribute                 Entry   Data       Value
! Name                      Number  Type
! ---------                 ------  ----       -----
  "TITLE"                      1:    CDF_CHAR   {"ISTP WIND spin phase CDF"}.
  "Project"                    1:    CDF_CHAR   {"ISTP>International " -
                                                 "Solar-Terrestrial Physics"}.
  "Discipline"                 1:    CDF_CHAR   {"Space Physics"}.
  "Source_name"                1:    CDF_CHAR   {"WIND>Wind Interplanetary " -
                                                 "Plasma Laboratory"}.
  "Data_version"               1:    CDF_CHAR   {" "}.
  "Data_type"                  1:    CDF_CHAR   {"K0>Key Parameter"}.
  "Descriptor"                 1:    CDF_CHAR   {"SPHA>Spin Phase"}.
  "START_DATE"                 1:    CDF_CHAR   {"                         "}.
  "END_DATE"                   1:    CDF_CHAR   {"                         "}.
  "ADID_ref"                   1:    CDF_CHAR   {"NSSD0137"}.
  "Logical_file_id"            1:    CDF_CHAR   {" "}.
  "TEXT"                       1:    CDF_CHAR   {"To be supplied"}.
  "MODS"                       1:    CDF_CHAR   {"12/17/92 - Original " -
                                                 "Implementation, CCR 87"}
                               2:    CDF_CHAR   {"6/14/94 - CCR ISTP 1852, " -
                                                 "updated CDHF skeleton to " -
                                                 "CDF standards - JT"}
                               3:    CDF_CHAR   {"11/9/94 - Correct errors " -
                                                 "made in ccr 1852.  CCR 1884"}.
!-------------------------------------------------------------
#VARIABLEattributes

   "FIELDNAM"
   "VALIDMIN"
   "VALIDMAX"
   "SCALEMIN"
   "SCALEMAX"
   "LABLAXIS"
   "UNITS"
   "FORMAT"
   "LABL_PTR_1"
   "UNIT_PTR"
   "FORM_PTR"
   "MONOTON"
   "DEPEND_0"
   "DEPEND_1"
   "FILLVAL"
   "VAR_TYPE"
   "DICT_KEY"
```

Table 3–16. ISTP WIND Spin-Phase CDF (2 of 4)

```
!------------------------------------------------------------
#variables
!   Variable         Data            Number     Record       Dim
!   Name             Type            Elements   Variance     Variance
!   -------          ----            --------   --------     --------
    "Epoch"          CDF_EPOCH          1          T            F
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Spin phase EPOCH time" }
   "VALIDMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "VALIDMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "SCALEMIN"  CDF_EPOCH     { 01-JUL-1992 00:00:00.000 }
   "SCALEMAX"  CDF_EPOCH     { 31-DEC-2020 23:59:59.000 }
   "LABLAXIS"  CDF_CHAR      { "Epoch" }
   "UNITS"     CDF_CHAR      { "ms" }
   "MONOTON"   CDF_CHAR      { "INCREASE" }
   "FILLVAL"   CDF_REAL8     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
!------------------------------------------------------------
!   Variable         Data            Number     Record       Dim
!   Name             Type            Elements   Variance     Variance
!   -------          ----            --------   --------     --------
    "Time_PB5"       CDF_INT4           1          T            T
!  Attribute     Data          Value
!  Name          Type
!-----------     -----         ------
   "FIELDNAM"    CDF_CHAR      { "Spin phase PB5 time" }
   "VALIDMIN"    CDF_INT4      { 1992, 183, 0 }
   "VALIDMAX"    CDF_INT4      { 2020, 366, 86399000 }
   "SCALEMIN"    CDF_INT4      { 1992, 183, 0 }
   "SCALEMAX"    CDF_INT4      { 2020, 366, 86399000 }
   "LABL_PTR_1"  CDF_CHAR      { "label_time" }
   "UNIT_PTR"    CDF_CHAR      { "unit_time" }
   "FORM_PTR"    CDF_CHAR      { "format_time" }
   "DEPEND_0"    CDF_CHAR      { "Epoch" }
   "DEPEND_1"    CDF_CHAR      { "unit_time" }
   "FILLVAL"     CDF_INT4      { -2147483648 }
   "VAR_TYPE"    CDF_CHAR      { "data" }
   "DICT_KEY"    CDF_CHAR      { " " }.

!------------------------------------------------------------
!   Variable         Data            Number     Record       Dim
!   Name             Type            Elements   Variance     Variance
!   -------          ----            --------   --------     --------
    "label_time"     CDF_CHAR          27          F            T
!  Attribute     Data          Value
!  Name          Type
!-----------     -----         ------
   "FIELDNAM"  CDF_CHAR      { "Label for Time_PB5" }
   "VAR_TYPE"  CDF_CHAR      { "metadata" }
   "DICT_KEY"  CDF_CHAR      { " " }.

     [1] = { "Year                       " }
     [2] = { "Day of Year (Jan 1 = day 1)" }
     [3] = { "Elapsed ms of Day          " }
!------------------------------------------------------------
```

Table 3–16. ISTP WIND Spin-Phase CDF (3 of 4)

```
!   Variable          Data              Number     Record       Dim
!   Name              Type              Elements   Variance     Variance
!   -------           ----              --------   --------     --------
    "unit_time"       CDF_CHAR              4          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"  CDF_CHAR      { "Units for Time_PB5" }
   "VAR_TYPE"  CDF_CHAR      { "metadata" }
   "DICT_KEY"  CDF_CHAR      { " " }.

     [1] = { "year" }
     [2] = { "day " }
     [3] = { "msec" }

!-------------------------------------------------------------
!   Variable          Data              Number     Record       Dim
!   Name              Type              Elements   Variance     Variance
!   -------           ----              --------   --------     --------
    "format_time"     CDF_CHAR              2          F            T

!  Attribute    Data          Value
!  Name         Type
!-----------    -----         ------
   "FIELDNAM"  CDF_CHAR      { "Formats for Time_PB5" }
   "VAR_TYPE"  CDF_CHAR      { "metadata" }
   "DICT_KEY"  CDF_CHAR      { " " }.

     [1] = { "I4" }
     [2] = { "I3" }
     [3] = { "I8" }

!-------------------------------------------------------------
!   Variable           Data              Number     Record       Dim
!   Name               Type              Elements   Variance     Variance
!   --------           ----              --------   --------     --------
    "SPIN_PHASE"       CDF_REAL4             1          T            F
!  Attribute   Data          Value
!  Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Spin phase angle" }
   "VALIDMIN"  CDF_REAL4     { 0.0 }
   "VALIDMAX"  CDF_REAL4     { 6.283185307 }
   "SCALEMIN"  CDF_REAL4     { 0.0 }
   "SCALEMAX"  CDF_REAL4     { 6.283185307 }
   "LABLAXIS"  CDF_CHAR      { "SP Angle" }
   "UNITS"     CDF_CHAR      { "rad" }
   "FORMAT"    CDF_CHAR      { "F12.8" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
!-------------------------------------------------------------
!   Variable           Data              Number     Record       Dim
!   Name               Type              Elements   Variance     Variance
!   --------           ----              --------   --------     --------
    "AVG_SPIN_RATE"    CDF_REAL4             1          T            F
```

Table 3–16. ISTP WIND Spin-Phase CDF (4 of 4)

```
! Attribute   Data          Value
! Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Average spin rate" }
   "VALIDMIN"  CDF_REAL4     { 0.0 }
   "VALIDMAX"  CDF_REAL4     { 6.283185307 }
   "SCALEMIN"  CDF_REAL4     { 0.0 }
   "SCALEMAX"  CDF_REAL4     { 6.283185307 }
   "LABLAXIS"  CDF_CHAR      { "Avg Spn Rt" }
   "UNITS"     CDF_CHAR      { "rad/sec" }
   "FORMAT"    CDF_CHAR      { "F12.8" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
!--------------------------------------------------------------
!   Variable            Data            Number     Record       Dim
!   Name                Type            Elements   Variance     Variance
!   --------            ----            --------   --------     --------
    "STNDEV_SPIN_RATE"  CDF_REAL4          1          T            F
! Attribute   Data          Value
! Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Std dev of spin rate" }
   "VALIDMIN"  CDF_REAL4     { 0 }
   "VALIDMAX"  CDF_REAL4     { 0.62831853 }
   "SCALEMIN"  CDF_REAL4     { 0 }
   "SCALEMAX"  CDF_REAL4     { 0.62831853 }
   "LABLAXIS"  CDF_CHAR      { "Stdv Spn R" }
   "UNITS"     CDF_CHAR      { "rad/sec" }
   "FORMAT"    CDF_CHAR      { "F12.8" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_REAL4     { -1.0E31 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
!--------------------------------------------------------------
!   Variable            Data            Number     Record       Dim
!   Name                Type            Elements   Variance     Variance
!   --------            ----            --------   --------     --------
    "FAULT"             CDF_INT4           1          T            F
! Attribute   Data          Value
! Name        Type
!-----------   -----         ------
   "FIELDNAM"  CDF_CHAR      { "Fault level status indicator" }
   "VALIDMIN"  CDF_INT4      { 0 }
   "VALIDMAX"  CDF_INT4      { 3 }
   "SCALEMIN"  CDF_INT4      { 0 }
   "SCALEMAX"  CDF_INT4      { 3 }
   "LABLAXIS"  CDF_CHAR      { "Stat Ind" }
   "UNITS"     CDF_CHAR      { " " }
   "FORMAT"    CDF_CHAR      { "I1" }
   "DEPEND_0"  CDF_CHAR      { "Epoch" }
   "FILLVAL"   CDF_INT4      { -2147483648 }
   "VAR_TYPE"  CDF_CHAR      { "data" }
   "DICT_KEY"  CDF_CHAR      { " " }.
!--------------------------------------------------------------
#end
```

APPENDIX A—LEVEL-ZERO FILE SIZES

Table A–1 provides the daily level-zero production file sizes for each of the GEOTAIL, WIND, and POLAR instruments. Note that the daily level-zero file size for an instrument is identical to the quantity of level-zero data for the instrument for a day. Table A–2 provides the quantity of level-zero quicklook data produced per pass for each of the GEOTAIL instruments.

Table A–1. ISTP Mission Level-Zero Daily Production Files (1 of 2)

Mission Instrument	Production Size (MB/day)
GEOTAIL	
PWI	18.50
HEP	21.50
MGF	13.90
LEP	26.10
EFD	13.90
EPIC	32.10
CPI	56.50
S/C Housekeeping	18.50
Q/A	0.13
(Subtotal)	201.13
WIND	
WAVES	24.40
EPACT	13.04
MFI	13.55
SWE	23.88
SMS	22.33
3-D Plasma	26.47
TGRS	11.49
KONUS	3.73
S/C Data	7.35
Q/A Data	0.15
(Subtotal)	146.34

Table A–1. ISTP Mission Level-Zero Daily Production Files (2 of 2)

Mission Instrument	Production Size (MB/day)
POLAR	
PWI	57.38
HYDRA	65.13
MFE	18.64
TIMAS	57.38
TIDE	57.38
UVI	152.95
VIS	142.62
PIXIE	65.13
CAMMICE	28.98
CEPPAD	47.05
EFI	39.30
SEPS	(tbd)
S/C Data	26.39
Q/A Data	0.43
(Subtotal)	758.76
Total	1106.30

Notes: 1. Production sizing is derived from telemetry format and data rates.
2. Sizing estimates include 10-percent overhead.
3. WIND and POLAR sizes are based on instrument rates from the spacecraft contractor as provided in Reference J.

Table A–2. GEOTAIL Level-Zero Quicklook Files

Mission Instrument	Production Size (MB/pass)
PWI	0.78
HEP	0.91
MGF	0.60
LEP	1.11
EFD	0.91
EPIC	1.37
CPI	2.40
S/C Data	0.78
Q/A Data	0.02
Total	8.88

APPENDIX B—KEY PARAMETER VOLUMES

Table B–1 presents the key parameter volumes for each of the ISTP GEOTAIL, WIND, POLAR, and ground-based experiments.

Table B–1. Key Parameter Volumes (1 of 2)

Mission	Experiment	Key Parameter Volume (MB/Day)
GEOTAIL	PWI	0.078
	HEP	0.100
	MGF	0.034
	LEP	0.166
	EFD	0.056
	EPIC	0.342
	CPI	0.100
	(subtotal)	0.876
WIND	WAVES	0.133
	EPACT	0.111 *
	MFI	0.078
	SWE	0.111 *
	SMS	0.276
	3-D PLASMA	0.166
	TGRS	0.133
	KONUS	0.000
	(subtotal)	1.008

Table B–1. Key Parameter Volumes (2 of 2)

Mission	Experiment	Key Parameter Volume (MB/Day)
POLAR	PWI	0.111
	HYDRA	0.551 *
	MFE	1.101
	TIMAS	0.221
	TIDE	0.551
	UVI	26.511
	VIS	22.001
	PIXIE	2.696
	CAMMICE	0.551
	CEPPAD	0.815
	EFI	0.881
	SEPS	0.221 *
	(subtotal)	56.211
Ground-Based	CANOPUS	0.265
	DARN	0.749 **
	SESAME	0.098
	SONDRESTROMFJORD	0.221
	(subtotal)	1.333
	TOTAL	59.428

* Estimate, actual is TBS
** 0.248 for first 2 years
Note: All volumes include SFDU volume and 10-percent overhead.

APPENDIX C—EXTENDED MINOR FRAMES

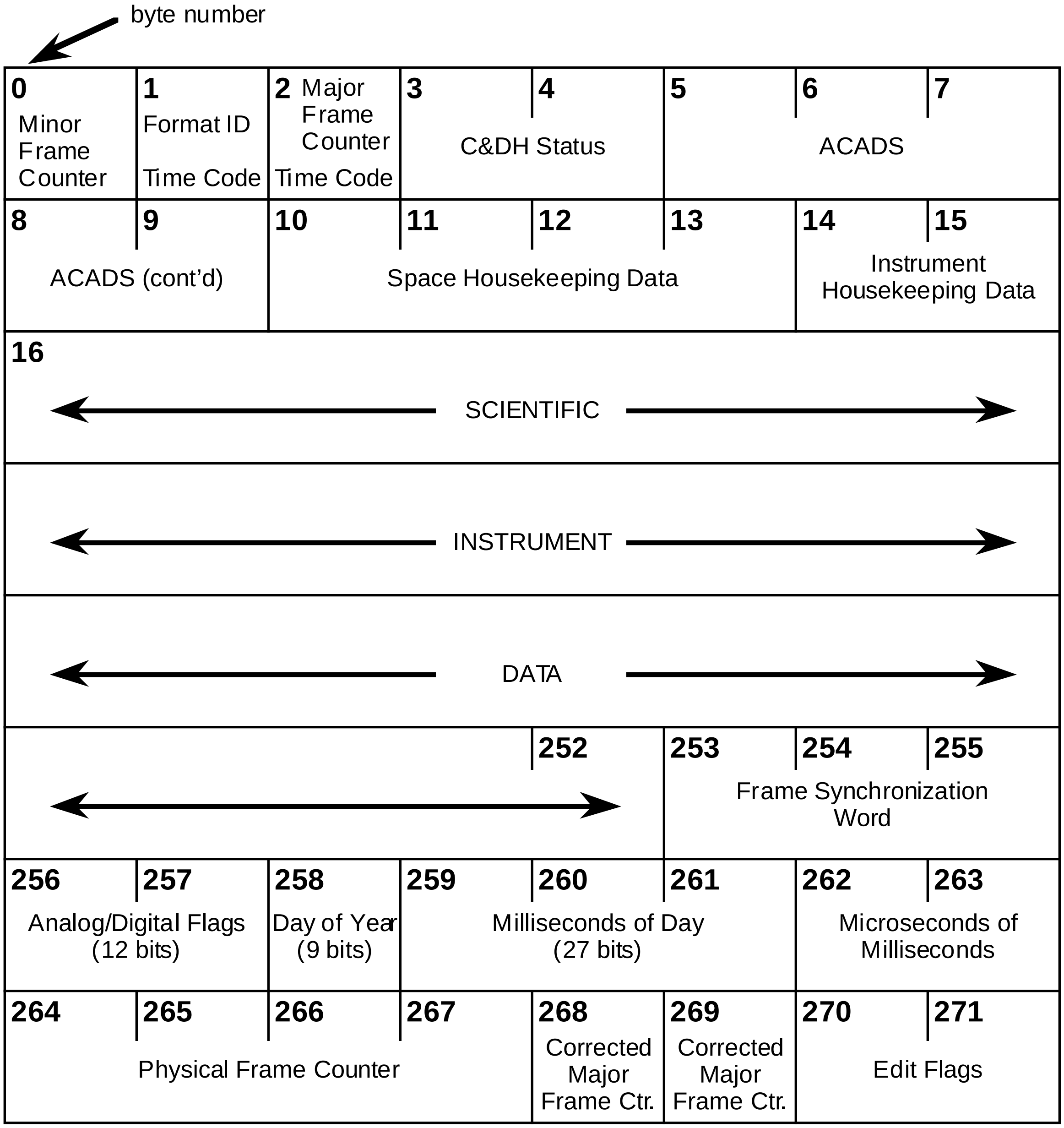
The GTDM DCF transfers extended minor frames of WIND and POLAR telemetry to the CDHF for near–real–time processing.

The basic unit that provides data for ISTP processing is known as the minor frame. Satellites produce minor frames by incorporating data from instruments aboard satellites with header and trailer data that uniquely identifies each minor frame. Some examples of header and trailer data are counters, times associated with a minor frame, and the status of the satellite when it generated the minor frame. Each satellite produces a minor frame using formats specifically designed for that satellite. However every minor frame processed by ISTP can be divided into four basic fields. The four basic fields of a minor frame are defined as:

Minor Frame Header
Scientific Instrument Data
Frame Frame Word
Minor Frame Trailer

The minor frame header contains fields that indicates the status of the frame when the satellite generated the minor frame. The scientific instrument data field contains data from several instrument sensors on board the satellite multiplexed into a conglomeration of data based on a prespecified format. The frame synchronization word contains a bit pattern through which software keeps minor frames in synchronization. The minor frame trailer contains minor frame identification fields as well as the time that the minor frame was frame at the ground station.

Figure C–1 presents the WIND extended minor frame; Figure C–2 presents the POLAR frame minor frame.



Notes: 1. Each byte represents 8 bits.

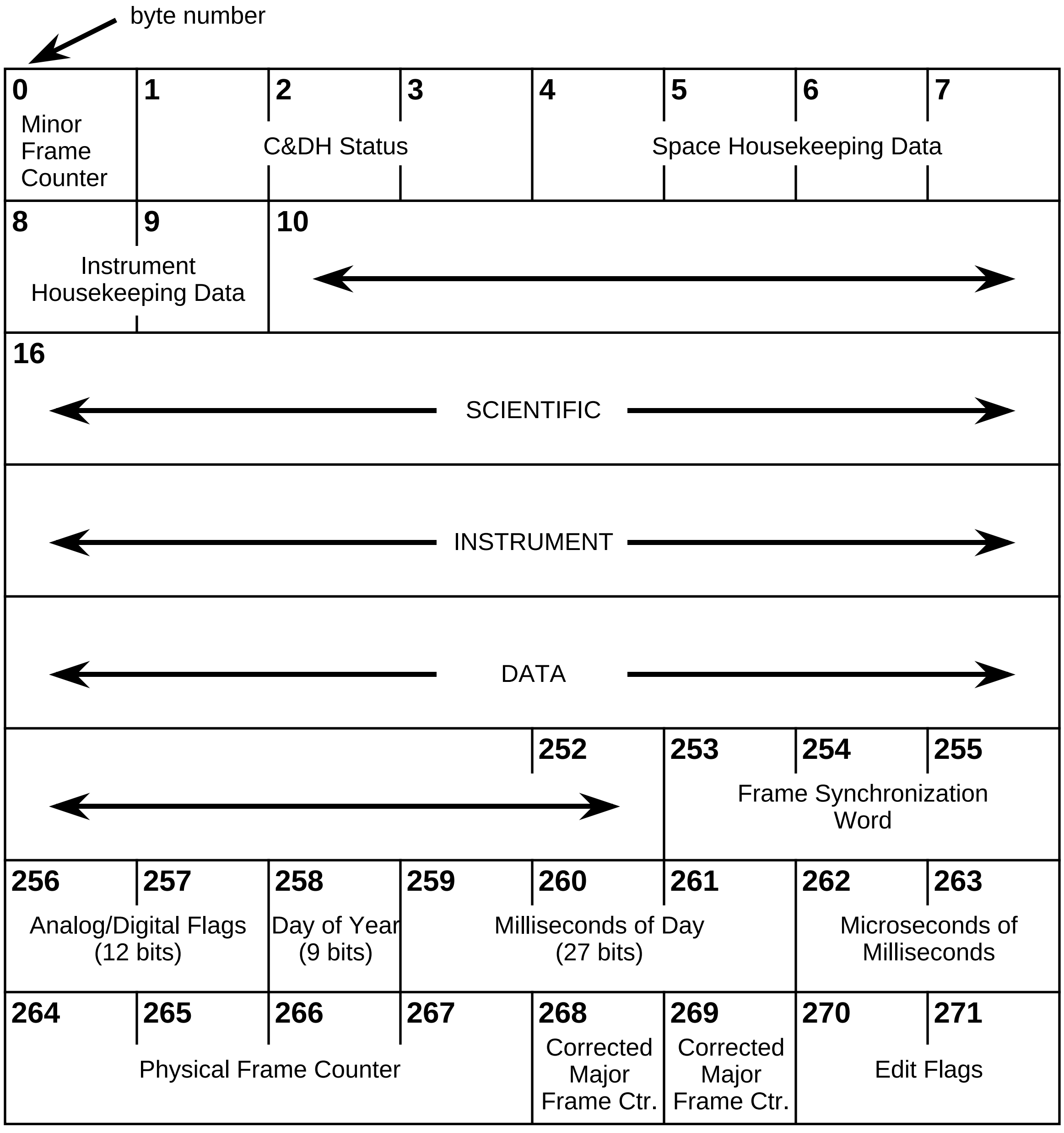
2. Byte 1–Format ID/Time Code/C&DH Status

Format ID subcommutated every 5 minor frames, starting with minor frame 0. Time Code subcommutated every 25 minor frames, starting with minor frames 4, 9, and 14.

Byte 2–Major Frame Counter/Time Code/C&DH Status

Major frame counter subcommutates every 25 minor frames, starting with minor frame 0. Time Code subcommutated every 25 minor frames starting with minor frames 4, 9, and 14.

Figure C–1. WIND Extended Minor Frame



Notes: Each byte represents 8 bits.

Figure C–2. POLAR Extended Minor Frame

APPENDIX D—FILE-NAMING CONVENTIONS, CD-ROM VOLUME IDENTIFIER, VOLUME DESCRIPTION AND INDEX FILES, AND DIRECTORY STRUCTURE

D.1 File-Naming Conventions

In general, the ISTP data and associated SFDU files distributed by the DDF on physical media conform to the ISTP CDHF file-naming conventions described in detail in Section 2.6. However, two different file-naming conventions are used for SOHO data and SFDU files.

SOHO data files that are processed or used by the CDHF conform to the ISTP CDHF file-naming conventions, which are described in Section 2.6 and are summarized below. These files include the G005 AOCS HK1, G007 Attitude 1, G008 Attitude 2, G013 CELIAS HK, G014 CEPAC HK, G029 CELIAS Science, G030 CEPAC Science, G039 VIRGO Science, CELIAS KP, COSTEP KP, ERNE KP, all summary data, the as-run-plans, ancillary data, predictive and definitive orbit data, definitive attitude, full-time resolution attitude, and command history.

All other SOHO data files conform to the MOSDD Pacor II file-naming conventions, which are described in Section 10 of Reference 12 and are summarized below. The following is an explanation of the two file-naming conventions and their effect on the long and short (eight-character name with three-character extension) filenames of the SOHO data files.

Figure D–1 shows the Pacor II long file-naming convention, and Figure D–2 shows the Pacor II short file-naming convention. Figure D–3 shows the ISTP CDHF long file-naming convention, and Figure D–2 shows the ISTP CDHF short file-naming convention.

Filename	**Mission Name_Group_Data Type_Starttime_ Version.File Extension**
where:	
Mission Name	SOHO
Group ID	Gnnn (defined in Table D–1)
Data Type	QL (quick look) or LZ (level zero)
Starttime	YYYY-MM-DDThh:mm:ssZ, (where: YYYY = Year (e.g., 1995) MM = Month (01–12) DD = Day of month (01–31) T = The alphabetic character “T” to separate the day from the time hh = Hour of the day (01–24) mm = Minute of the hour (01–60) ss = Second of the minute (01–60) Z = The alphabetic character “Z” for UTC
Version	Vxx for version of the file (xx = 01 unless the file was reprocessed)
File Extension	DAT1 or SFDU (data file or associated SFDU file)

Figure D–1. Pacor II Long File-Naming Convention

Filename	YDDD$$VV.File Extension
where:	
Y	Last digit of year (e.g., 5 for 1995)
DDD	Julian date (001–366)
$$	File number of day (e.g., 01 for first file of the day)
VV	Version number of file (VV = 01 for the first version of the file)
File Extension	Dxx or SFD, when SFDU references multiple files, xx will identify a specific file.

Figure D–2. Pacor II Short File-Naming Convention

Filename	Mission__Datatype_Descriptor_Date_Version.File Extension
where:	
Mission	Identifies the mission or investigation (e.g., SO for SOHO)
Datatype	Identifies the type of data (e.g., LZ for level zero)
Descriptor	Describes or further qualifies the data (e.g., PRE for predictive data)
Date	Identifies the starting date of the data in the file, in the form YYYYMMDD, where: YYYY = 4-digit year (e.g., 1995) MM = 2-digit month (01–12) DD = 2-digit day of month (01–31)
Version	Identifies the version of the data (01–99)
File Extension	DAT = data file, SFD = SFDU file, CDF = Common Data Format Sxx = data file segment, where xx= 01–99

Note: Missions, data types, and desciptors are listed in Section 2.6.

Figure D–3. ISTP CDHF Long File-Naming Convention

Filename	YYMMDDVV.XXX
where:	
YY	Last two digits of the year (e.g., 95 for 1995)
MM	Month (01–12)
DD	Day of the month (01–31)
VV	Version number of the file (01–99) (key parameters could be recomputed several times)
XXX	File extension (e.g., DAT, CDF, SFD, S01-S99)

Figure D–4. ISTP CDHF Short File-Naming Convention

Table D–1. SOHO Group IDs

GROUP ID	PACKET NAME	GROUP ID	PACKET NAME
G001	SVM HK1	G022	SUMER HK
G002	SVM HK2	G023	SWAN HK
G003	SVM HK3	G024	UVC HK
G004	SVM HK4	G025	VIRGO HK
G005	AOCS HK1	G026	CDS Science LR
G006	AOCS HK2	G027	CDS Science MR
G007	Attitude 1	G028	CDS Science HR
G008	Attitude 2	G029	CELIAS Science
G009	S/W	G030	CEPAC Science
G010	OBT	G031	EIT/LASCO Science LR
G011	Experiment HK	G032	EIT/LASCO Science HR
G012	CDS HK	G033	GOLF Science
G013	CELIAS HK	G034	MDI Science
G014	CEPAC HK	G035	SUMER Science LR
G015	EIT/LASCO HK1	G036	SUMER Science HR
G016	EIT/LASCO HK2	G037	SWAN Science
G017	EIT/LASCO HK3	G038	UVCS Science
G018	GOLF HK	G039	VIRGO Science
G020	Reserved EGSE	G0410	MDI HK

Thus the short Pacor II filename "51570101.D01" is equivalent to the ISTP CDHF filename "95060601.DAT." That is Version 1 of a data file created on day 157 (June 6) of 1995.

The long filenames within the SFDU headers differ as follows:

Pacor II: SOHO_G001_LZ_1995-06-07T06-56-21Z_V01.DAT1;
CDHF: SO_LZ_G001_19950607_V01.DAT

For more clarification, Figure D–5 contains a current SOHO SFDU received by the DDF from the Pacor II system on June 7, 1995.

The Figure D–5 SFDU header and associated data file were then transferred to the CDHF and then back to the DDF on June 8, 1995, with the SFDU header shown in Figure D–6; this header conforms to the ISTP CDHF file-naming convention. Note the differences in the reference parameters.

```
CCSD1Z00000100000552NSSD1K00021300000383
PROJECT=“ISTP>International Solar-Terrestrial Physics”;
DISCIPLINE=“Solar Physics>Solar and Heliospheric Observatory”;
SOURCE_NAME=“SOHO>Solar And Heliospheric Observatory”;
DATA_TYPE=“LZ>LevelZero”;
DESCRIPTOR=“G001>APID3”;
START_DATE=1995-06-07T06:56:21Z;
STOP_DATE=1995-06-07T15:58:22Z;
DATA_VERSION=1;
GENERATION_DATE=1995-06-07T21:01:29Z;
FILE_ID=SOHO_G001_LZ_1995-06-07T06-56-21Z_V01;
CCSD1R00000300000129
REFERENCETYPE=CCSDS0;
LABEL=NSSD3IE0R0010000000;
REFERENCE=(“$1=51570101.D01, $2=SOHO_G001_LZ_1995-06-07T06-56-21Z_V01.DAT1”);
```

Figure D–5. Pacor II SFDU Header

```
CCSD1Z00000100001004NSSD1K00006000000440
PROJECT = “ISTP>INTERNATIONAL SOLAR-TERRESTRIAL PHYSICS”;
DISCIPLINE = “SOLAR PHYSICS>SOLAR AND HELIOSPHERIC OBSERVATORY”;
SOURCE_NAME = “SOHO>SOLAR AND HELIOSPHERIC OBSERVATORY”;
DATA_TYPE = “LZ>LEVELZERO”;
DESCRIPTOR = “G001>APID3”;
START_DATE = 1995-06-07T06:56:21.555Z;
STOP_DATE = 1995-06-07T15:58:22.137Z;
DATA_VERSION = 1;
GENERATION_DATE = 1995-06-07T21:01:29Z;
FILE_ID = SO_LZ_G001_19950607_V01;
ICSS_RELEASE = “Release 5.1C”;
CCSD1R00000300000524
REFERENCETYPE = ($CCSDS3);
LABEL = NSSD3IE0000000000001;
REFERENCE = (“$1=95060701.DAT,$2=SO_LZ_G001_19950607_V01.DAT1”);
```

Figure D–6. ISTP CDHF SFDU Header

Note: Most of the rest of the information in this appendix has been extracted from Reference 3.

D.2. CD-ROM Description

The CD-ROMs used to distribute ISTP data conform to ISO 9660, which defines the physical and logical formats of the CD-ROM. This ensures that most CD-ROM drives on most platforms will be able to read the ISTP CD-ROMs. Also, ISTP CD-ROMs follow other emerging NASA standards, guidelines, and practices, especially the use of CCSDS’s SFDUs and a file-naming and directory structure that will be compatible with most platforms. For example, all copies of a CD-ROM are uniquely identified by one volume identifier. No other CD-ROM is labeled with the same identifier. Even an update has a different volume identifier from the volume it succeeds. Figure D–7 is a volume identifier description that illustrates how the CD-ROMs will be logically and physically named, and it includes sample volume identifiers.

Every CD-ROM also contains several files that help describe its data. The root directory contains the volume description file (VOLDESC.SFD). It is an ASCII SFDU-encapsulated file that lists the CD-ROM contents. Major VOLDESC.SFD items are a list of the distribution destinations and a list of files distributed to each destination. The filenames conform to the long file-naming conventions specified in Section D.1. A VOLDESC.SFD list of files can be parsed to allow for automated selection of the desired file via the directory tree. The VOLDESC.SFD also contains the volume creation date, product name, sequence number, and some SFDU information. Sections 2.4, 2.5, and D.1 describe the SFDUs. Figure D–8 is a sample VOLDESC.SFD file that illustrates the content of the file put on each CD-ROM to list its files.

Purpose:	Name a CD-ROM carries.
Format:	USA_NASA_DDF_*product_name_nnnn* where *product_name* is the name given to the product consisting of particular data and nnnn is a 4-digit sequence number starting with 1 for the number of the CD-ROM set being distributed for that product.
Size:	Up to 32 characters
Examples:	USA_NASA_DDF_WI_LZ_0001 USA_NASA_DDF_GE_LEP_LZ_0001 USA_NASA_DDF_PO_LZ_0001

Notes:
1. The sequence number identifies a specific distribution of a particular product.
2. Every volume of a multivolume CD-ROM set has the same volume ID. The volume number in the VOLDESC file of each CD-ROM volume identifies the specific volume of a multivolume set.

Figure D–7. CD-ROM Volume ID Description

The root directory also contains subdirectories for documentation, indexes, and data. The DOCUMENT subdirectory contains an abstract that provides a high-level description of the data product. The INDEX subdirectory contains a file that allows the user to determine which CD-ROM contains other files produced for the data product. This file provides a cumulative index of all files distributed to date on CD-ROM. The filenames conform to the long file-naming conventions specified in Section D.1. Figure D–9 is a sample of the Cumulative Index file put on each CD-ROM to allow the user to determine which CD-ROM set contains other files produced for the data product. The DATA subdirectory contains additional subdirectories that allow the data to be grouped logically, depending on the product.

The decision to distribute ISTP datasets using CD-ROMs has made it necessary to make some technical trade-offs regarding format and naming conventions and has resulted in a proposed extension to the SFDU standards. ISTP CD-ROMs will use the ISO 9660 Level 1 standard to provide compatibility across major computing platforms. However, this standard has the disadvantage of supporting only eight-character by three-character (8.3) filenames. As described in

```
CCSD3ZF0000100000001NSSD3KS00109VTOCMARK
DATE: 11-JAN-1993
PRODUCT NAME: ISTP DEMO
MEDIA CODE: CD
SEQUENCE NUMBER: 1
VOLUME NUMBER: 1
TYPE OF DISTRIBUTION:
DISTRIBUTION DESTINATIONS
WILLIAM MISH                      WM00 1
FILES DISTRIBUTED TO EACH DESTINATION
ABSTRACT.TXT                      DOCUMENT/ABSTRACT.TXT            2048
INDEX.TXT                         INDEX/INDEX.TXT                  4096
CN_K0_BARS_19930106_V01.CDF       DATA/CN/BARS/K0/93010601.CDF     64512       19930106000000   19930106235959
CN_K0_BARS_19930106_V01.SFDU      DATA/CN/BARS/K0/93010601.SFD     1024        19930106000000   19930106235959
DN_K0_GBAY_19930104_V01.CDF       DATA/DN/GBAY/K0/93010401.CDF     449024      19930104000000   19930104235959
DN_K0_GBAY_19930104_V01.SFDU      DATA/DN/GBAY/K0/93010401.SFD     1024        19930104000000   19930104235959
DN_K0_PACE_19921229_V01.CDF       DATA/DN/PACE/K0/92122901.CDF     480768      19921229000000   19921229235959
DN_K0_PACE_19921229_V01.SFDU      DATA/DN/PACE/K0/92122901.SFD     1024        19921229000000   19921229235959
GE_AT_DEF_19921228_V01.CDF        DATA/GE/DEF/AT/92122801.CDF      24064       19921228000000   19921228235959
GE_AT_DEF_19921228_V01.SFDU       DATA/GE/DEF/AT/92122801.SFD      1024        19921228000000   19921228235959
GE_K0_EPI_19921226_V01.CDF        DATA/GE/EPI/K0/92122601.CDF      349696      19921226000000   19921226235959
GE_K0_EPI_19921226_V01.SFDU       DATA/GE/EPI/K0/92122601.SFD      1024        19921226000000   19921226235959
GE_K0_EPI_19930102_V01.DAT        DATA/GE/EPI/LZ/93010201.DAT      289336332   19930102000000   19930102235959
GE_LZ_EPI_19930102_V01.SFDU       DATA/GE/EPI/LZ/93010201.SFD      1024        19930102000000   19930102235959
GE_LZ_MGF_19930105_V01.DAT        DATA/GE/MGF/LZ/93010501.DAT      12567040    19930105000000   19930105235959
GE_LZ_MGF_19930105_V01.SFDU       DATA/GE/MGF/LZ/93010501.SFD      1024        19930105000000   19930105235959
CCSD$$MARKERVTOCMARKCCSD3RF0000300000001
REFERENCETYPE=$CCSDS3
LABEL = CCSD3SD0000200000001
REFERENCE = "$2=ABSTRACT.TXT,$1=DOCUMENT/ABSTRACT.TXT"
LABEL = NSSD3KF0013600000001
REFERENCE =  "$2=INDEX.TXT,$1=INDEX/INDEX.TXT"
LABEL=ATTACHED
REFERENCE="$2=CN_K0_BARS_19930106_V01.SFDU,$1=DATA/CN/BARS/K0/93010601.SFD"
REFERENCE="$2=DN_K0_GBAY_19930104_V01.SFDU,$1=DATA/DN/GBAY/K0/93010401.SFD"
REFERENCE="$2=DN_K0_PACE_19921229_V01.SFDU,$1=DATA/DN/PACE/K0/92122901.SFD"
REFERENCE="$2=GE_AT_DEF_19921228_V01.SFDU,$1=DATA/GE/DEF/AT/92122801.SFD"
REFERENCE="$2=GE_K0_EPI_19921226_V01.SFDU,$1=DATA/GE/EPI/K0/92122601.SFD"
REFERENCE="$2=GE_LZ_EPI_19930102_V01.SFDU,$1=DATA/GE/EPI/LZ/93010201.SFD"
REFERENCE="$2=GE_LZ_MGF_19930105_V01.SFDU,$1=DATA/GE/MGF/LZ/93010501.SFD"
```

Figure D–8. Sample VOLDESC File

CN_K0_BARS_19920720_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/CN/BARS/K0/92072001.SFD
DN_K0_GBAY_19930103_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/DN/GBAY/K0/93010301.SFD
DN_K0_PACE_19921205_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_001 DATA/DN/PACE/K0/92120501.SFD
GE_AT_DEF_19920908_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/GE/DEF/AT/92090801.SFD
GE_K0_EPI_19920908_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/GE/EPI/K0/92090801.SFD
GE_LZ_EPI_19921231_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/GE/EPI/LZ/92123101.SFD
GE_OR_DEF_19920727_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/GE/DEF/OR/92072701.SFD
GE_OR_PRE_19920804_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/GE/PRE/OR/92080401.SFD
GE_LZ_MGF_19930101_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/GE/MGF/LZ/93010101.SFD
GE_SD_NUL_19930105_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/GE/SD/93010501.SFD
I8_K0_MAG_19920825_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/I8/MAG/K0/92082501.SFD
SE_K0_VLF_19921201_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_0001 DATA/SE/VLF/K0/92120101.SFD
GE_CH_NUL_19921201_V01.SFDU	USA_NASA_DDF_ISTP_DEMO_001 DATA/GE/CH/93010101.SFD

Figure D–9. Sample Cumulative Index File

Section 2.6, the ISTP CDHF uses long filenames for conveying maximum information representation in the name. To provide CD-ROMs that continue to carry along the long filenames, the SFDUs have been modified such that both the long filenames and the corresponding short (8.3) filenames are present in the REFERENCE OBJECT portion of the SFDU. The short filenames are a subset of the long filenames (as described in Section D.1). The formats of the ISTP CDHF and Pacor II short and long filenames are given in Section D.1.

The CD-ROM has a directory structure that parallels the long filenames. The directory structure itself is used to convey the long filename information that is missing from the short filename. As a result, a short filename, in combination with its position in the containing directory structure, conveys the same information as a long filename. Figure D–10 presents a schematic of a CD-ROM directory showing how the ISTP CDHF long filenames are used to develop a CD-ROM directory

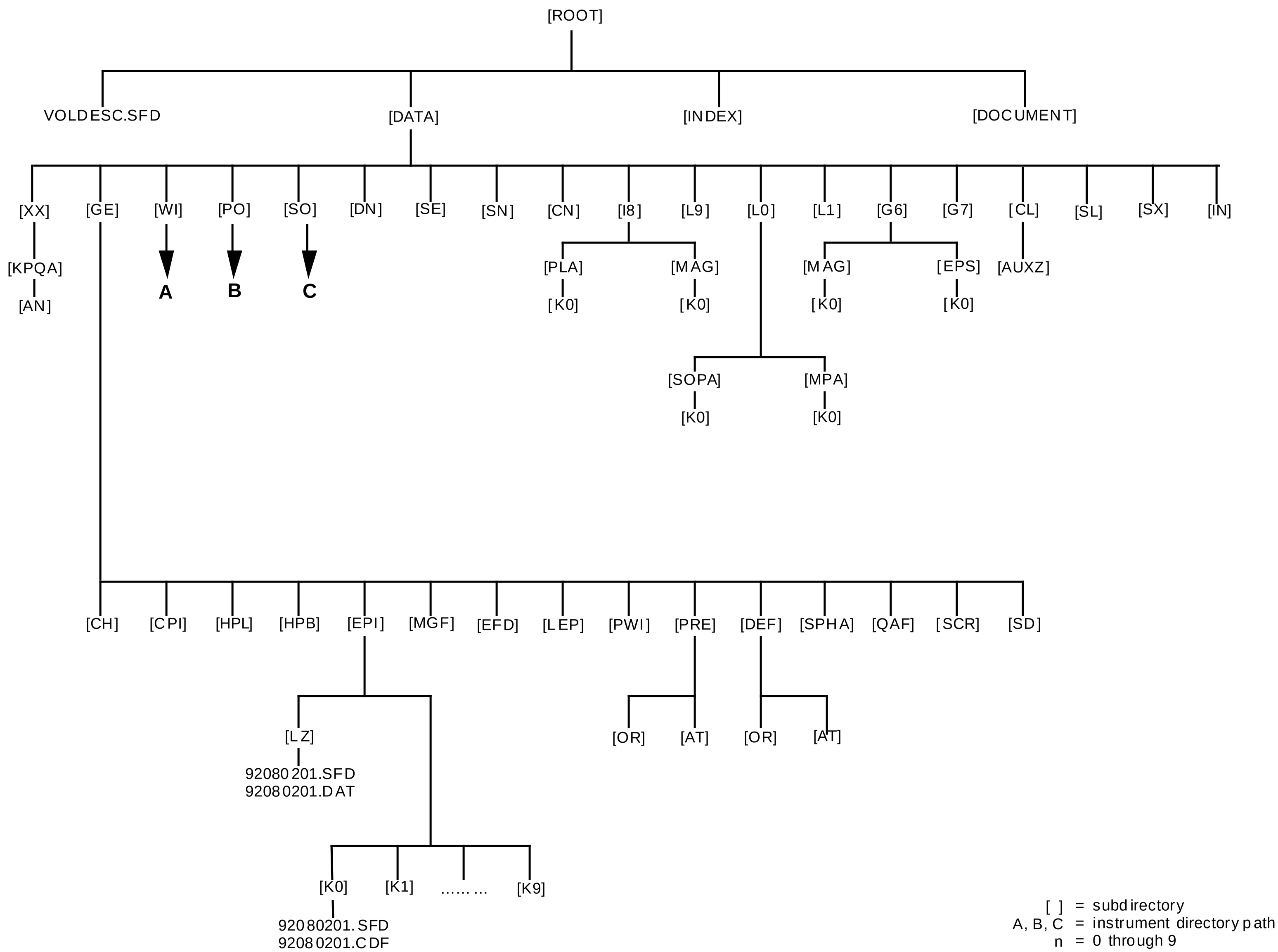


Figure D–10. ISTP CD–ROM Directory Structure (1 of 4)

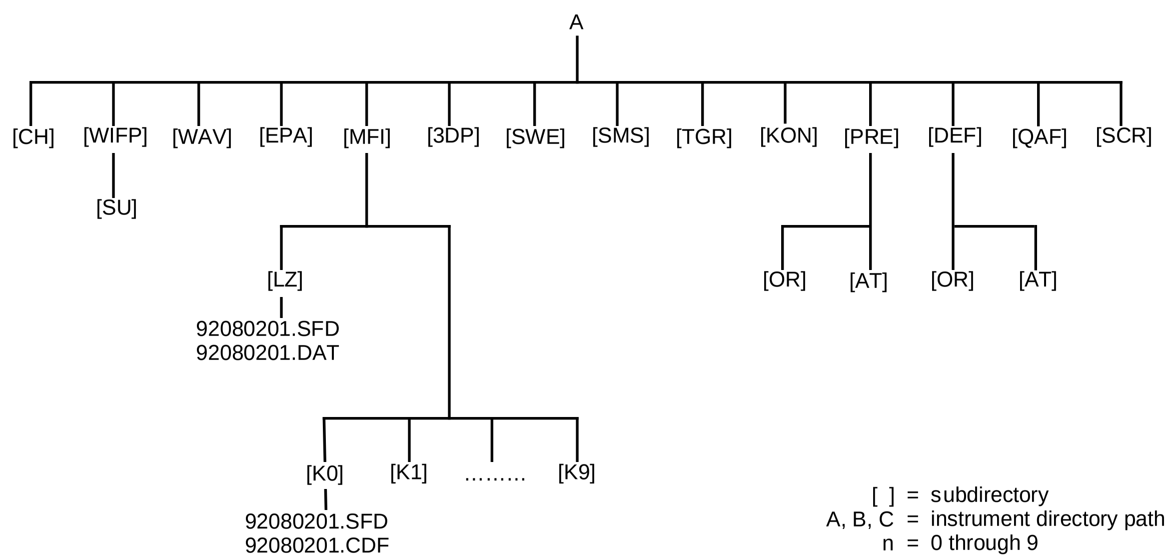


Figure D–10. ISTP CD–ROM Directory Structure (2 of 4)

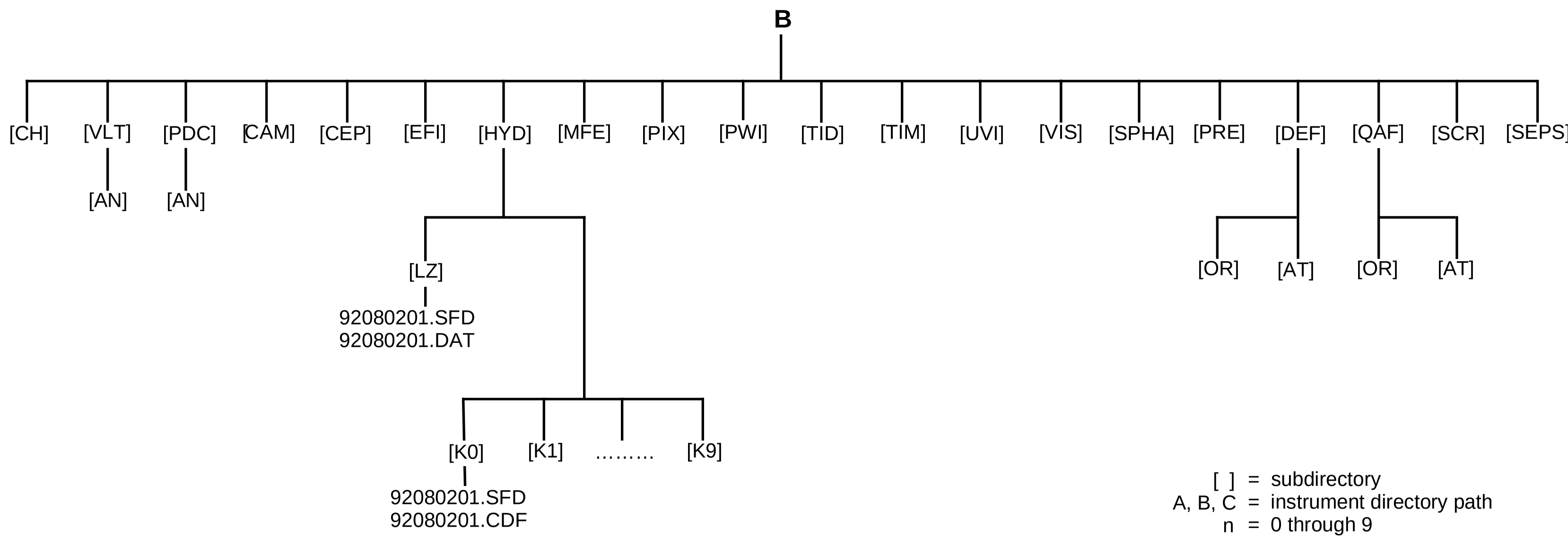
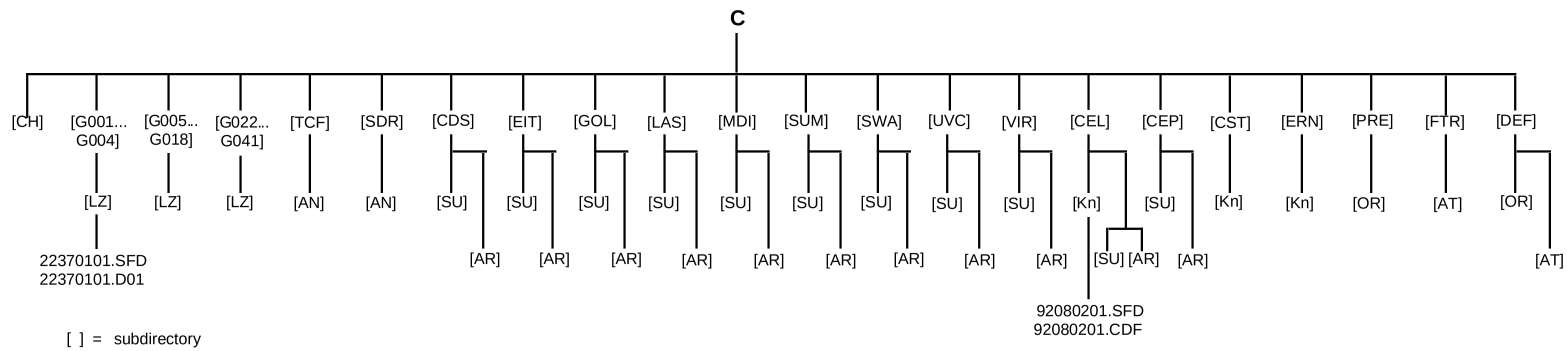


Figure D–10. ISTP CD–ROM Directory Structure (3 of 4)



[ ] = subdirectory
A, B, C = instrument directory path
n = 0 through 9

Note: The short filenames shown for directory path ROOT/DATA/SO/G001...G004/LZ is an example of the Pacor II short file-naming convention.
The short filenames shown for directory path ROOT/DATA/SO/CEL/Kn is an example of the ISTP CDHF short file-naming convention.

Figure D–10. ISTP CD–ROM Directory Structure (4 of 4)

structure and short filenames that are compatible with the ISO 9660 Level 1 standard. (Note that the directory structure names conform to the ISTP CDHF long file-naming convention although filenames conform to either the ISTP CDHF or Pacor II short file-naming convention, as applicable)

The directory structure has been updated to include directories for the following data files:

- Nonmission-specific key parameter quality ancillary data files
- Fields and particles ancillary data files for the WIND mission
- Color lookup table and pointing vector table ancillary data files for the VIS experiment of the POLAR mission
- Data files that support the SOHO mission
- Data files for the Ulysses, SAMPEX, and the Interball missions

The nonmission-specific key parameter quality ancillary data files will reside in the directory defined by the filename XX_AN_KPQA_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.XX.KPQA.AN).

The WIND fields and particles ancillary data files will reside in the directory defined by the filename WI_SU_WIFP_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.WI.WIFP.SU).

The POLAR VIS experiment video color lookup table ancillary data files will reside in the directory defined by the filename PO_AN_VLT_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.PO.VLT.AN).

The POLAR VIS experiment pointing vector table ancillary data files will reside in the directory defined by the filename PO_AN_PDC_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.PO.PDC.AN).

The data files that support the SOHO mission include the following:

- SOHO level-zero and housekeeping data files
- Key parameter data files for the CELIAS and the CEPAC (ERNE/COSTEP) experiments
- SOHO summary data and daily report files
- SOHO ancillary data files for time correlation
- SOHO command history files
- SOHO definitive and predictive orbit data fields
- SOHO definitive and full-time resolution attitude data files

The level-zero and housekeeping data files will reside in the directories defined by the filename SO_LZ_Gnnn_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.G027.LZ). (Note that the files in these directories will be named using either the Pacor II or the ISTP CDHF short filename, as applicable.)

The key parameter data files for the CELIAS experiment will reside in the directory defined by the filename SO_Kn_CEL_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.CEL.Kn).

The key parameter data files for the CEPAC COSTEP experiment will reside in the directory defined by the filename SO_Kn_CST_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.CST.Kn)

The key parameter data files for the CEPAC ERNE experiment will reside in the directory defined by the filename SO_Kn_ERN_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.ERN.Kn).

The SOHO summary data files will reside in the directory defined by the filename SO_SU_<instrument/descriptor>_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.CDS.SU).

The SOHO daily report data files will reside in the directory defined by the filename SO_AR_<instrument/descriptor>_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.LAS.AR).

The SOHO TCF ancillary data files will reside in the directory defined by the filename SO_AN_TCF_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.TCF.AN).

The SOHO SDR ancillary data files will reside in the directory defined by the filename SO_AN_SDR_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.SDR.AN).

The SOHO command history data files will reside in the directory defined by the filename SO_CH_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.CH).

The SOHO predictive orbit data files will reside in the directory defined by the filename SO_OR_PRE_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.PRE.OR).

The SOHO definitive orbit data files will reside in the directory defined by the filename SO_OR_DEF_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.DEF.OR).

The SOHO definitive attitude data files will reside in the directory defined by the filename SO_AT_DEF_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.DEF.AT).

The SOHO high-resolution attitude data files will reside in the directory defined by the filename SO_AT_FTR_yyyymmdd_Vnn under the DATA directory (e.g., ROOT.DATA.SO.FTR.AT).

The data files for the Ulysses (UL), SAMPEX (SX), and Interball (IN) missions will reside in the directory defined by filenames of the form <mission short name>_Kn_ <instrument/descriptor>_yyyymmdd_Vnn (e.g., ROOT.DATA.IN.TAIL.Kn).

It should be noted that this directory structure is based on the information that is currently available. The directory structure as it is currently designed can be easily expanded to add directories as required. There are three basic directories under the [ROOT.DATA] directory. The mission directories are the first-level directories under the [ROOT.DATA]. Under the mission directories are the instrument or descriptor directories. The lowest level directories are the data type directories. To set up directories for new data it is necessary to determine the mission, the descriptor, and the data type. This information is provided in the data filename in the form < short mission name>_ <short data type name_<instrument/descriptor>_yyyymmdd_Vnn.

Note that even though the instrument/descriptor directory is under the short data type name directories, the descriptor comes after the data type in the data filename.

The two exceptions to adding new directories as described above are (1) the command history files, and (2) the GEOTAIL SIRIUS data files, which always reside under the mission directory at the same level as the instrument/descriptor directory.

APPENDIX E—POLAR WIDEBAND DATA

This appendix provides the formats of the POLAR PWI wideband data.

E.1 Level-Zero Experiment File

The POLAR PWI wideband level-zero data are transferred in experiment files, each of which contains 1 hour of data segmented on the hour time boundary (01:00, 02:00, 03:00, etc.). When time-ordering is performed using the ground data capture time, segmentation will be at the precision of one minor frame because each minor frame has an associated ground data capture time. When time-ordering is performed using the PB5 clock in the data, segmentation will be at the precision of one group of minor frames containing the PB5 clock. (For WBR, segmentation will be at the precision of four minor frames. For HRP, segmentation will be at the precision of eight minor frames.) Each Experiment file, shown in Figure E–1, consists of a label record, containing data quality and coverage information, followed by data records containing the actual spacecraft telemetry. Detailed formats describing the Experiment file can be found in Figures E–1 through E–7.

E.1.1 Experiment File Label Record

Figure E–2 presents the Experiment file label record. The following entries describe each of the fields in the Experiment file label record:

a. Byte Location: 00000–00003
Type/Length: Integer/4
Description: The IPD Generic Data Capture Facility (GDCF) Satellite Identification value used to identify POLAR data (always = 26)

b. Byte Location: 00004–00007
Type/Length: Character/4
Description: The PWI Wideband Instrument Name (always = “PWIW”)

c. Byte Location: 00008–00011
Type/Length: Integer/4
Description: The physical record number of the current record in the Experiment file (for the label record, this value will always = 1)

d. Byte Location: 00012–00015
Type/Length: Integer/4
Description: The total number of physical records in the Experiment file (including the label record)

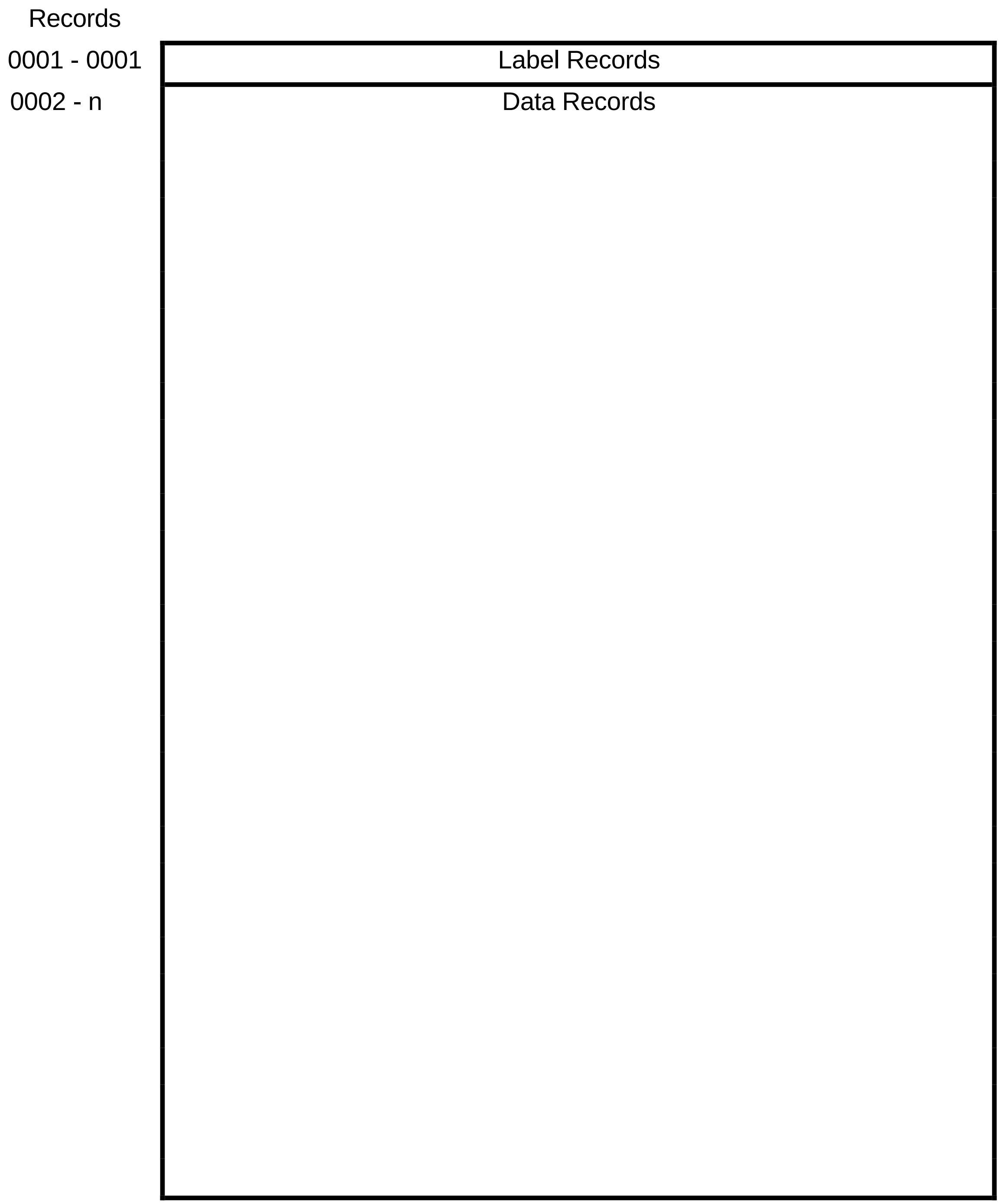


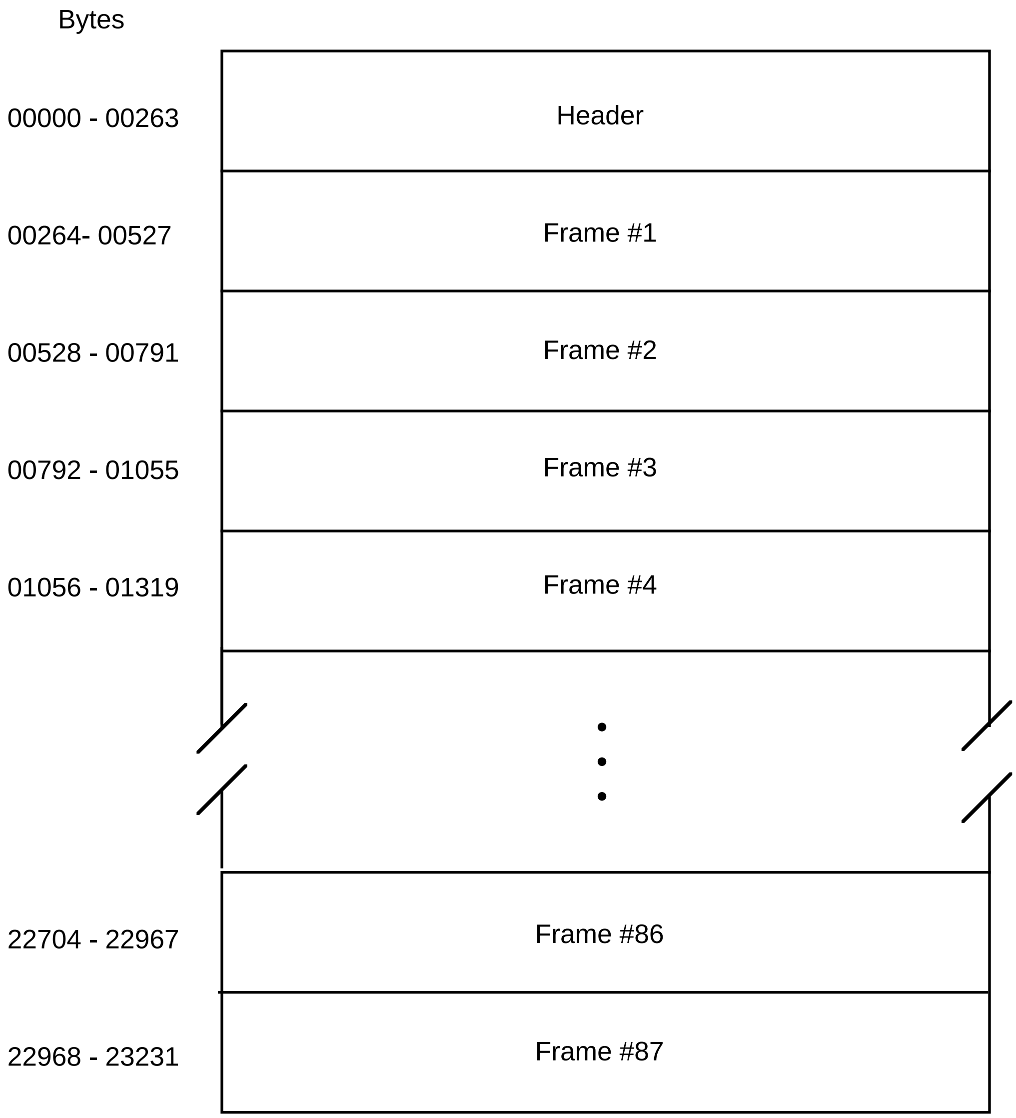
Figure E–1. Experiment (EXP) File

Bytes	
00000 - 00003	Spacecraft ID (=26)
00004 - 00007	Instrument Name (='PWIW')
00008 - 00011	Physical Record Number in File
00012 - 00015	Number of Physical Records in File
00016 - 00019	Raw Data Time – First Frame in File
00020 - 00023	Raw Data Time – First Frame in File (continued)
00024 - 00027	Raw Data Time – Last Frame in File
00028 - 00031	Raw Data Time – Last Frame in File (continued)
00032 - 00035	Corrected Data Time: Year – First Frame in File
00036 - 00039	Corrected Data Time: Day – First Frame in File
00040 - 00043	Corrected Data Time: Msec – First Frame in File
00044 - 00047	Corrected Data Time: Year – Last Frame in File
00048 - 00051	Corrected Data Time: Day – Last Frame in File
00052 - 00055	Corrected Data Time: Msec – Last Frame in File
00056 - 00059	Frame Counter – First Frame in File
00060 - 00063	Frame Counter – Last Frame in File
00064 - 00067	HRP Sequence Counter – First HRP Frame in File
00068 - 00071	HRP Sequence Counter – Last HRP Frame in File
00072 - 00075	Number of Frames Expected
00076 - 00079	Number of Frames in File

Figure E–2. Experiment File Label Record (1 of 2)

Bytes	
00080 - 00083	Number of WBR Frames in File
00084 - 00087	Number of HRP Frames in File
00088 - 00091	Number of Perfect Frames in File
00092 - 00095	Spare
00096 - 00099	Spare
00100 - 00103	Number of Fill Frames in File
00104 - 00107	Number of Frames in File Flagged as Containing a Legitimate Mode Change
00108 - 00111	Number of Frames in File Flagged as Containing Mode Bits in Error
00112 - 00115	Number of Frames in File Flagged as Containing a Frame Counter Error
00116 - 00119	Number of Frames in File Flagged as Containing an HRP Sequence Counter Error
00120 - 00123	Number of Frames in File Flagged as Containing a Frame Synch Word Error
00124 - 00131	IPASS Program Version Number (8 Characters)
00132 - 00147	IPASS Program Run Date/Time (format = 'YYYY/DDDHHMNSS') (16 Characters)
00148 - 00151	IPASS Program Rerun Number
00152 - 00195	Experiment File Name as Catalogued on the LZPS (44 Characters)
00196 - 00239	SFDU File Name as Catalogued on the LZPS (44 Characters)
00240 - 00243	PB5/Ground Data Capture Time Processing Flag
00244 - 00247	IPASS Run Type
00248 - 00251	File-Level Sequence Number
00252 - 23231	Spare

Figure E–2. Experiment File Label Record (2 of 2)



Note: Frame numbers correspond to physical frame number within a Data Record and do not bear any correlation to the 8-bit frame counter in the telemetry

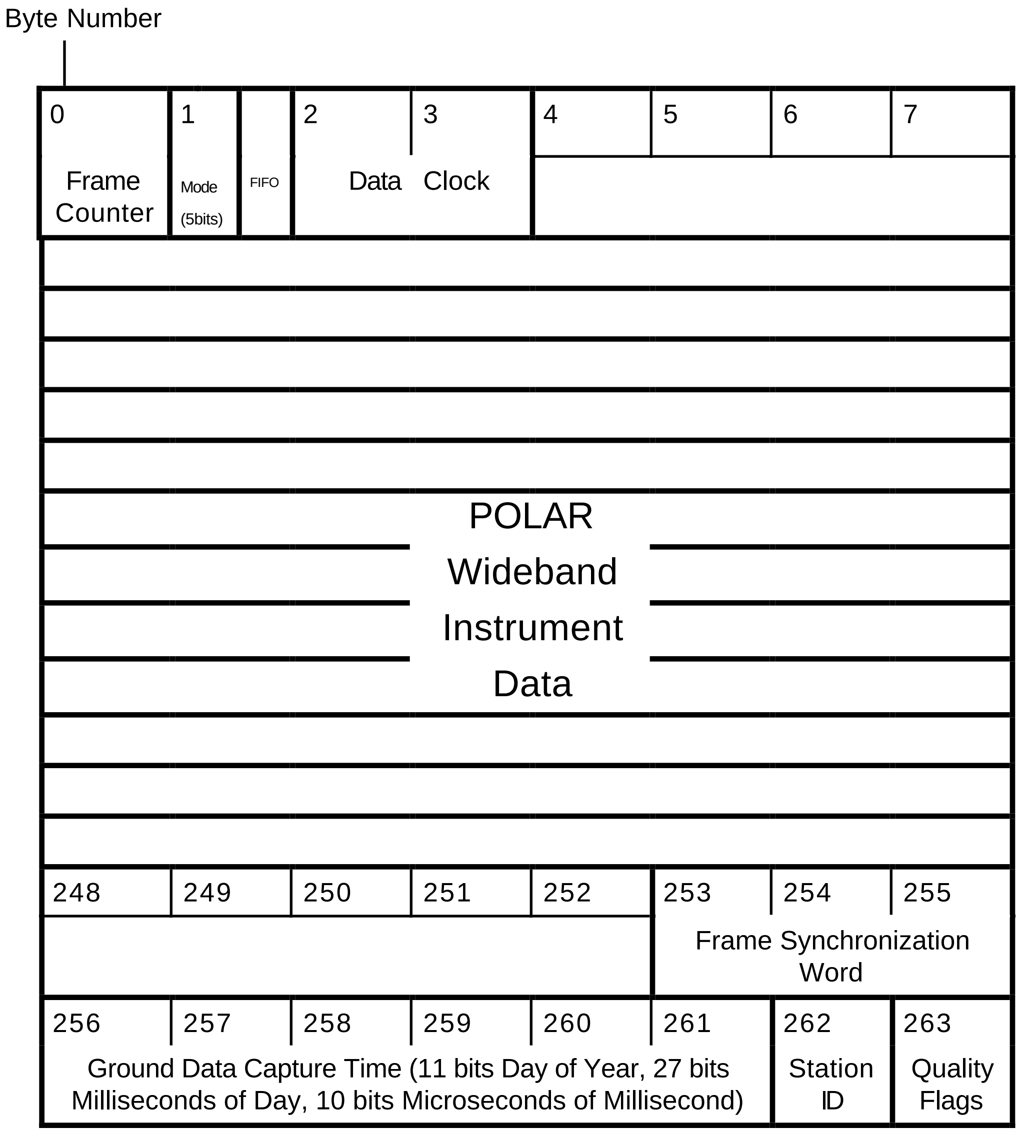
Figure E–3. Experiment File Data Record

Byte Number

0	1	2	3	4	5	6	7
Instrument Name ('PWIW')				Physical Record Number in File			
8	9	10	11	12	13	14	15
Frame Counter - 1st Frame				HRP Sequence Counter - 1st HRP Frame			
16	17	18	19	20	21	22	23
Corrected Data Time -Year		Corrected Data Time -Day		Corrected Data Time -Milliseconds of Day			
24	25	26	27	28	29	30	31
Raw Data Time						Spare	
32	33	34	35	36	37	38	39
Number of WBR Frames in Record				Number of HRP Frames in Record			
40	41	42	43	44	45	46	47
Number of Frames in Record				Number of Perfect Frames in Record			
48	49	50	51	52	53	54	55
SPARE							
56	57	58	59	60	61	62	63
Number of Fill Frames in Record				Number of Frames in Record Indicating Legitimate Mode Change			
64	65	66	67	68	69	70	71
Number of Frames in Record Containing Mode Bits in Error				Number of Frames in Record Containing Frame Counter Error			
72	73	74	75	76	77	78	79
Number of Frames in Record Containing HRP Sequence Ctr Error				Number of Frames in Record Containing Frame Sync Word (FSW) Error			
SPARE							
256	257	258	259	260	261	262	263

Notes:
1) Corrected Data Time is the time associated with the first frame in the record.
2) Raw Data Time is the uncorrected time associated with the first frame in the record.
3) When time-ordering is performed using ground data capture time, each minor frame has an associated data time.
4) When time-ordering is performed using the PB5 clock in the data, a group of frames is associated with a data time in the following manner:
   WBR Data – A data time is associated with up to four consecutive frames containing an 8-bit Frame Counter modulo 4 value that updates from 0 to 3
   HRP Data – A data time is associated with up to eight consecutive frames containing an 11-bit HRP Sequence Counter modulo 8 value that updates from 0 to 7

Figure E–4. Experiment File Data Record Header



Notes:

1) Ground data capture time is extrapolated from the time tagged on the Nascom block without correction (due to transmission errors, etc.).

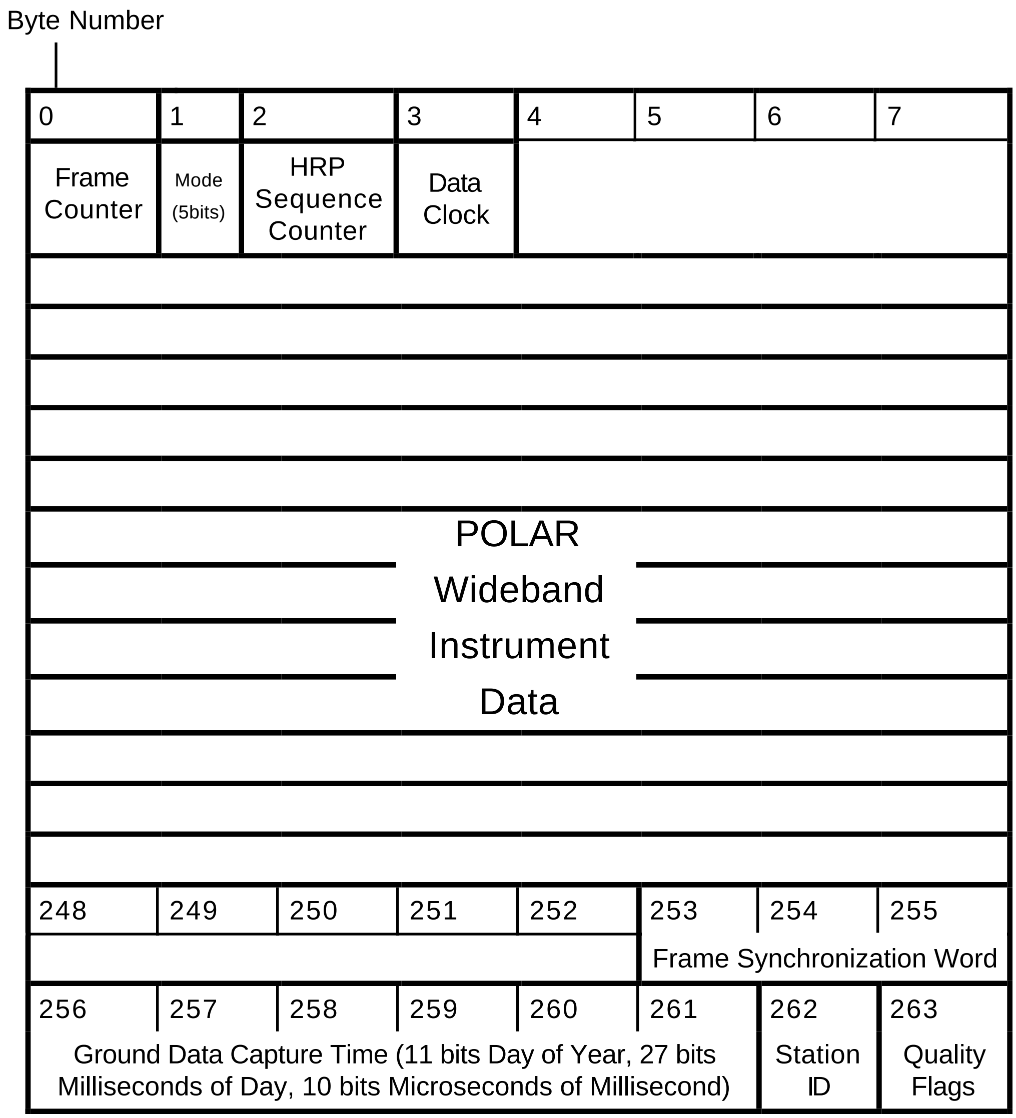
2) Station ID is defined as follows:

   1 = Canberra

   2 = Goldstone

   3 = Madrid

Figure E–5. Experiment File WBR Frame



Notes:

1) Ground data capture time is extrapolated from the time tagged on the Nascom block without correction (due to transmission errors, etc.).

2) Station ID is defined as follows:

1 = Canberra

2 = Goldstone

3 = Madrid

Figure E–6. Experiment File HRP Frame

Bit	
0	Spare
1	Spare
2	Fill Frame
3	Legitimate Mode Change
4	Mode Error
5	Frame Counter Error
6	HRP Sequence Counter Error
7	Frame Synchronization Word (FSW) Error

Figure E–7. Experiment File Frame Quality Byte

e. Byte Location: 00016–00023
Type/Length: Byte/8
Description: The uncorrected PB5 time code or ground data capture time associated with the last frame in the Experiment file

f. Byte Location: 00024–00031
Type/Length: Byte/8
Description: The uncorrected PB5 time code or ground data capture time associated with the last frame in the Experiment file

g. Byte Location: 00032–00035
Type/Length: Integer/4
Description: The corrected PB5/ground data capture time year associated with the first frame in the Experiment file

h. Byte Location: 00036–00039
Type/Length: Integer/4
Description: The corrected PB5/ground data capture time day of year associated with the first frame in the Experiment file

i. Byte Location: 00040–00043
Type/Length: Integer/4
Description: The corrected PB5/ground data capture time milliseconds of day associated with the first frame in the Experiment file

j. Byte Location: 00044–00047
Type/Length: Integer/4
Description: The corrected PB5/ground data capture time year associated with the last frame in the Experiment file

k. Byte Location: 00048–00051
Type/Length: Integer/4
Description: The corrected PB5/ground data capture time day of year associated with the last frame in the Experiment file

l. Byte Location: 00052–00055
Type/Length: Integer/4
Description: The corrected PB5/ground data capture time milliseconds of day associated with the last frame in the Experiment file

m. Byte Location: 00056–00059
Type/Length: Integer/4
Description: The corrected frame counter of the first frame in the Experiment file

n. Byte Location: 00060–00063
Type/Length: Integer/4
Description: The corrected frame counter of the last frame in the Experiment file

o. Byte Location: 00064–00067
Type/Length: Integer/4
Description: The corrected HRP sequence counter of the first HRP frame in the Experiment file

p. Byte Location: 00068–00071
Type/Length: Integer/4
Description: The corrected HRP sequence counter of the last HRP frame in the Experiment file

q. Byte Location: 00072–00075
Type/Length: Integer/4
Description: The number of frames expected to be in the Experiment file, calculated using the corrected times of the first and last frame in the file and the nominal time per frame

r. Byte Location: 00076–00079
Type/Length: Integer/4
Description: The total number of frames, including fill, in the Experiment file

s. Byte Location: 00080–00083
Type/Length: Integer/4
Description: The number of WBR frames, including fill, in the Experiment file

t. Byte Location: 00084–00087
Type/Length: Integer/4
Description: The number of HRP frames, including fill, in the Experiment file

u. Byte Location: 00088–00091
Type/Length: Integer/4
Description: The total number of non-fill frames in the Experiment file that did not contain a mode error, a frame counter error, an HRP sequence counter error, or a frame synch word error

v. Byte Location: 00092–00099
Type/Length: Byte/8
Description: Spare

w. Byte Location: 00100–00103
Type/Length: Integer/4
Description: The total number of fill frames in the Experiment file

x. Byte Location: 00104–00107
Type/Length: Integer/4
Description: The total number of frames in the Experiment file flagged as signifying a legitimate mode change

y. Byte Location: 00108–00111
Type/Length: Integer/4
Description: The total number of frames in the Experiment file flagged as containing mode bits in error

z. Byte Location: 00112–00115
Type/Length: Integer/4
Description: The total number of frames in the Experiment file flagged as containing a frame counter error

aa. Byte Location: 00116–00119
Type/Length: Integer/4
Description: The total number of frames in the Experiment file flagged as containing an HRP sequence counter error

bb. Byte Location: 00120–00123
Type/Length: Integer/4
Description: The total number of frames in the Experiment file flagged as containing a frame synch word error

cc. Byte Location: 00124–00131
Type/Length: Character/8
Description: The version number of the IPASS software that was used to create the Experiment file

dd. Byte Location: 00132–00147
Type/Length: Character/16
Description: The IPASS job run date and time in format "YYYY/DDD HHMNSS"

ee. Byte Location: 00148–00151
Type/Length: Integer/4
Description: The IPASS job rerun number

ff. Byte Location: 00152–00195
Type/Length: Character/44
Description: The Experiment file name as catalogued on the LZPS

Format = "EXP.L26.RYYDDD.THHMNSS.IUU" (left justified)

Where:

L	=	Level Zero Processing System Database Level (Production, Test, or Development)
R	=	IPASS Run Type (Production or Quicklook)
YY	=	Experiment file generation time—year
DDD	=	Experiment file generation time—day of year
HH	=	Experiment file generation time—hour of day
MN	=	Experiment file generation time—minute of hour
SS	=	Experiment file generation time—second of minute
UU	=	Segment number (beginning with 1) of the data contained in the Experiment file

gg. Byte Location: 00196–00239

Type/Length: Character/44

Description: The SFDU file name as catalogued on the LZPS

Format = “EXP.L26.RYYDDD.THHMNSS.SUU” (left justified)

Where:

L	=	Level Zero Processing System Database Level (Production, Test, or Development)
R	=	IPASS Run Type (Production or Quicklook)
YY	=	SFDU file generation time—year
DDD	=	SFDU file generation time—day of year
HH	=	SFDU file generation time—hour of day
MN	=	SFDU file generation time—minute of hour
SS	=	SFDU file generation time—second of minute
UU	=	Segment number (beginning with 1) of the data contained in the Experiment file

hh. Byte Location: 00240–00243

Type/Length: Integer/4

Description: Flag indicating whether the data was time-ordered and segmented using the PB5 time code present in the data or the ground data capture time; all ancillary time-related fields present in the Experiment File Label Record and Data Record Headers reflect the indicated time-ordering method

ii. Byte Location: 00244–00247

Type/Length: Character/4

Description: The IPASS job run type

jj. Byte Location: 00248–00251

Type/Length: Integer/4

Description: The Experiment file version number (will be set to one for the first Experiment file containing data for a given year, day, and hour and will be incremented by one for each Experiment file created thereafter containing data from the same year, day, and hour)

kk. Byte Location: 00252–23231

Type/Length: Byte/22980

Description: Spare

E.1.2 Experiment File Data Record

Figure E–3 presents the Experiment file data record. The data record consists of a data record header and a number of frames.

E.1.3 Experiment File Data Record Header

Figure E–4 presents the Experiment file data record header. The following entries describe each of the fields in the Experiment file data record header:

a. Byte Location: 000–003
Type/Length: Character/4
Description: The PWI Wideband Instrument Name (always = "PWIW")

b. Byte Location: 004–007
Type/Length: Integer/4
Description: The physical record number within the Experiment file of the current record

c. Byte Location: 008–011
Type/Length: Integer/4
Description: The corrected frame counter of the first frame in the record

d. Byte Location: 012–015
Type/Length: Integer/4
Description: The corrected HRP sequence counter of the first HRP frame in the record

e. Byte Location: 016–017
Type/Length: Integer/2
Description: The corrected time year associated with the first frame in the record

f. Byte Location: 018–019
Type/Length: Integer/2
Description: The corrected time day of year associated with the first frame in the record

g. Byte Location: 020–023
Type/Length: Integer/4
Description: The corrected time milliseconds of day associated with the first frame in the record

h. Byte Location: 024–029
Type/Length: Byte/6
Description: The uncorrected time code associated with the first frame in the record

i. Byte Location: 030–031
Type/Length: Byte/2
Description: Spare

j. Byte Location: 032–035
Type/Length: Integer/4
Description: The number of WBR frames, including fill, in the record

k. Byte Location: 036–039
Type/Length: Integer/4
Description: The number of HRP frames, including fill, in the record

l. Byte Location: 040–043
Type/Length: Integer/4
Description: The total number of frames, including fill, in the record

m. Byte Location: 044–047
Type/Length: Integer/4
Description: The number of non-fill frames in the record that are not flagged as indicating a mode error, a frame counter error, an HRP sequence counter error, or a frame synch word error

n. Byte Location: 048–055
Type/Length: Byte/8
Description: Spare

o. Byte Location: 056–059
Type/Length: Integer/4
Description: The number of fill frames in the record

p. Byte Location: 060–063
Type/Length: Integer/4
Description: The number of frames in the record flagged as indicating a legitimate mode change

q. Byte Location: 064–067
Type/Length: Integer/4
Description: The number of frames in the record flagged as containing a mode error

r. Byte Location: 068–071
Type/Length: Integer/4
Description: The number of frames in the record flagged as containing a frame counter error

s. Byte Location: 072–075
Type/Length: Integer/4
Description: The number of frames in the record flagged as containing an HRP sequence counter error

t. Byte Location: 076–079
Type/Length: Integer/4
Description: The number of frames in the record flagged as containing a frame synch word error

u. Byte Location: 080–263
Type/Length: Byte/184
Description: Spare

E.1.4 Experiment File Minor Frames

Figure E–5 presents the Experiment file WBR minor frame; Figure E–6 presents the Experiment file HRP minor frame. The following entries describe each of the fields in an Experiment file minor frame:

a. Byte Location: 000–252
Type/Length: Byte/253
Description: Spacecraft telemetry as downlinked from the spacecraft

b. Byte Location: 253–255
Type/Length: Byte/3
Description: Frame Synchronization Word (=HEX ‘FAF320’)

c. Byte Location: 256–261
Type/Length: Byte/6
Description: The time that the minor frame was captured at the Deep Space Network (DSN) site, formatted as follows:

Bits 00–10 = Day of year

Bits 11–37 = Milliseconds of day

Bits 38–47 = Microseconds of millisecond

This time is extrapolated from the time tagged on the Nascom blocks, without correction (due to transmission errors, etc.)

d. Byte Location: 262–262
Type/Length: Byte/1
Description: Station ID of the DSN site that captured the minor frame, specified as follows:

Station ID # 1 = Canberra, Australia

Station ID # 2 = Goldstone, California

Station ID # 3 = Madrid, Spain

e. Byte Location: 263–263
Type/Length: Byte/1
Description: Flags describing the quality of the minor frame

E.1.5 Experiment File Minor Frame Quality Byte

Figure E–7 presents the Experiment file minor frame quality byte. The following entries describe each of the flags in the Experiment file minor frame quality byte:

a. Bit Location: 0–1
Type/Length: Binary digit/2
Description: Spare

b. Bit Location: 2–2
Type/Length: Binary digit/1
Description: Flag indicating a fill frame

c. Bit Location: 3–3
Type/Length: Binary digit/1
Description: Flag indicating that a legitimate mode change (WBR to HRP or HRP to WBR) has occurred

d. Bit Location: 4–4
Type/Length: Binary digit/1
Description: Flag indicating that the mode bits contain an error (A parameterized number of continuous frames of the same mode must be found in order for that mode to be recognized as valid)

e. Bit Location: 5–5
Type/Length: Binary digit/1
Description: Flag indicating that 1 or more bits of the frame counter were in error

f. Bit Location: 6–6
Type/Length: Binary digit/1
Description: Flag indicating that 1 or more bits of the HRP sequence counter were in error

g. Bit Location: 7–7
Type/Length: Binary digit/1
Description: Flag indicating that 1 or more bits of the frame synch word were in error

E.2 Standard Formatted Data Unit File

Information describing a single Experiment file can be found in a detached header file known as the standard formatted data unit (SFDU) file. One SFDU file is created for each Experiment file. Figure E–8 is an example of a typical SFDU file.

Record	Bytes	
1	000–039	CCSD1Z00000100001004NSSD1K0000600006000000390
	042–096	PROJECT=“ISTP>International Solar-Terrestrial Physics”;
	099–148	DISCIPLINE=“Space Physics>Interplanetary Studies”;
	151–190	MISSION=“POLAR>Polar Plasma Laboratory”;
	193–235	DESCRIPTOR=“PWI>Plasma Wave Investigation”;
	238–268	DATA_TYPE=“WB>POLAR Wide Band”;
	271–302	START_DATE=1993-04-10T00:00:00Z;
	305–335	STOP_DATE=1993-04-10T00:59:59Z;
	338–374	GENERATION_DATE=1993-12-02T20:43:57Z
	377–392	DATA_VERSION=1;
	395–427	FILE_I =PO_WB_PWI_1993041000_V01;
	430–449	CCSD1R00000300000574
	452–475	REFERENCETYPE=($CCSDS3);
	478–504	LABEL=NSSD3IE0018600000001;
	507–509	REFERENCE=(“$1=93041001.I00,$2=PO_WB_PWI_1993041000_V01.DAT”);
2	000–059	
	062–509	

Notes: i) 1 SFDU File = 2 Records
ii) 1 Record = 512 Bytes
iii) Each line is followed by:
Carriage Return (ASCII hex 0D)
Line Feed (ASCII hex 0A)

Figure E–8. Example of an SFDU File

APPENDIX F—NEAR REAL TIME SERVER DATA

The data messages from the CDHF NRT subsystem Server have the format shown in Figure F–1. An NRT Server data message is composed of three parts:

- Header (24 bytes)
- Body (variable length)
- Trailer (8 bytes)

The message header contains four items:

- Block start indicator (8 bytes)—ASCII string "STARTBLK"
- Experiment indicator (4 bytes) (see Table F–1 for possible indicator values)
- Byte count (4 bytes)—Total number of bytes in a data block—IEEE 4-byte binary integer
- Time of transmission (8 bytes)—64-bit binary time

The message body contains either control information or level-zero data for a WIND or POLAR investigation. If the message is a control message in which the experiment indicator has a value of "CTL," the message has three possible formats:

- Used to indicate beginning of data pass
  Message body: 11-character ASCII string "STARTOFPASS"
- Used to indicate end of data pass
  Message body: 9-character ASCII string "ENDOFPASS"
- Used to indicate resumption of data after a transmit gap within the pass
  Message body: 10-character ASCII string "RESUMEPASS"

  Note: The NRT software handles the following interruptions:
    - Upstream disconnects
    - Failures in edit and decommutation recovery
    - KPGS floating-point traps

If the message contains level-zero data, the experiment indicator contains one of the values shown in Table F–1 and the message body contains the level-zero data for the corresponding WIND or POLAR instrument, as described in Section 3.1 and its subsections. The message body begins with an FLR, as described in Section 3.1.1. Each data record begins with a DRH, as described in Section 3.1.2, and contains the level-zero data for one major frame.

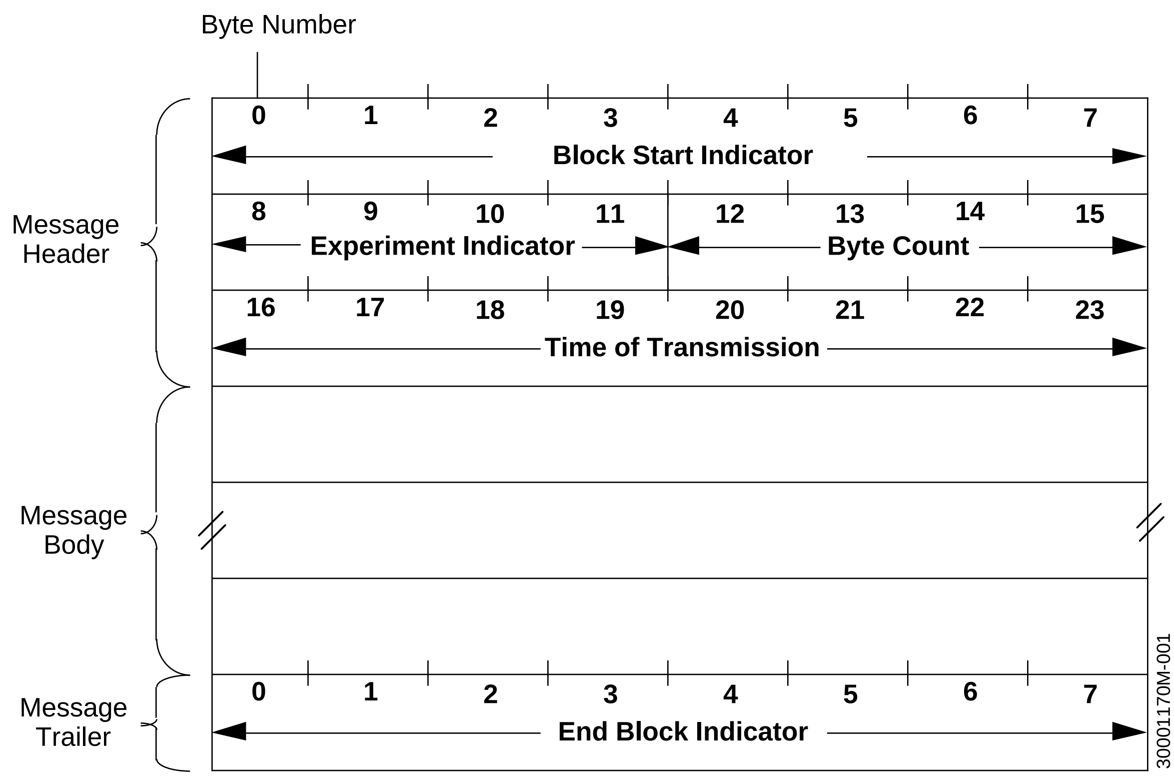


Figure F–1. Near Real Time Server Data Format

Table F–1. NRT Server Experiment Indicators

Message Indicator	Description
CTL	Control Message
	WIND Investigations
3DP	3-D Plasma Analyzer (3DPA)
EPA	Experimental Particle Acceleration Composition Transport (EPACT)
KON	Konus
MFI	Magnetic Fields Investigation
QAF	Quality File
SCR	Spacecraft Housekeeping
SMS	Solar Wind Suprathermal Ion Composition Studies
SWE	Solar Wind Experiment
TGR	Transient Gamma-Ray Spectrometer (TGRS)
WAV	Radio and Plasma Wave Instrument (WAVES)
	POLAR Investigations
CAM	Charge and Mass Magnetospheric Ion Composition Experiment (CAMMICE)
CEP	Comprehensive Energetic Particle Pitch Angle Distribution (CEPPAD)
EFI	Electric Fields Investigation
HYD	Fast Plasma Analyzer (HYDRA)
MFE	Magnetic Fields Experiment
PIX	Polar Ionospheric X-Ray Imaging Experiment (PIXIE)
PWI	Plasma Wave Instrument
QAF	Quality File
SCR	Spacecraft Housekeeping
SEP	Source/Loss-Cone Energetic Particle Spectrometer (SEPS)
TID	Thermal Ion Dynamics Experiment (TIDE)
TIM	Toroidal Imaging Mass-Angle Spectrograph (TIMAS)
UVI	Ultraviolet Imager
VIS	Visible Imaging System

LIST OF ACRONYMS

3DPA	3-D Plasma Analyzer
ADI	authority and description identifier
AIS	Advanced Ionospheric Sounder
ANSI	American National Standards Institute
APL	Applied Physics Laboratory
ARDB	As-Run Database
ASCII	American Standard Code for Information Interchange
ASI	All Sky Imager
ASPOC	Active Spacecraft Potential Control
ATC	absolute time code
AUX	auxiliary
BARS	BARS VHF Radar
BAS	British Antarctic Survey
bpi	bits per inch
CA	control authority
CAID	control authority identifier
CAMMICE	Charge and Mass Magnetospheric Ion Composition Experiment
CANOPUS	Canadian Auroral Network for the Origin of Plasmas in Earth's Neighborhood Program Unified Study
CCB	configuration control board
CCR	change control report
CCSDS	Consultative Committee for Space Data Systems
CCTV	closed circuit television
CD	collision detection
CDF	common data format
CDHF	Central Data Handling Facility
CDR	critical design review
CD-ROM	compact disc—read-only memory
CDS	Coronal Diagnostic Spectrometer
CELIAS	Charge, Element, and Isotope Analysis System
CEPAC	COSTEP-ERNE Particle Analysis Collaboration
CEPPAD	Comprehensive Energetic Particle Pitch Angle Distribution
CIO	contents identifier object
CIS	CLUSTER Ion Spectrometry Experiment
CMS	Command Management System
Cnt	count
Co-I	co-investigator
COSTR	Collaborative Solar-Terrestrial Research
CPI	Comprehensive Plasma Instrumentation
CR	carriage return
CRC	cyclic redundancy check

CSMA	carrier sense multiple access
DARN	Dual Auroral Radar Network
DCF	Data Capture Facility
DDCMP	Digital Data Communications Message Protocol
DDF	Data Distribution Facility
DDID	data description identifier
DDR	data description record
DDU	data description unit
dn	data number (uncalibrated number that comes from the instrument)
DEC	Digital Equipment Corporation
DECnet	DEC network
DED	data element dictionary
DFCD	data format control document
DNA	Digital Network Architecture
DPS	Data Processing Segment
DRH	data record header
DWP	Digital Wave-Processing Experiment
EBCDIC	Extended Binary-Coded Decimal Interchange Code
EDI	Electron Drift Instrument
EFD	Electronic Field Detector
EFW	Spherical Probe Electric Field and Wave Experiment
EFI	Electric Field Experiment
EIT	Extreme-Ultraviolet Imaging Telescope
EOF	end of file
	Experimentors' Operations Facility
EP8	Low-Energy Particles and Electrons (different energies from EPS)
EPACT	Energetic Particle Acceleration Composition Transport
EPIC	Energy Particles and Ion Composition
EPS	Low-Energy Particles and Electrons (F1 and P1 channels)
ESA	European Space Agency
FDF	Flight Dynamics Facility
FGM	Magnetic Field Experiment
FLR	file label record
FPI	Fabry-Perot Inferometer
FTR	full resolution attitude
GB	gigabyte
GBAY	Goose Bay High-Frequency (HF) Radar
GBI	ground-based investigator
GDCF	Generic Data Capture Facility
GDPS	Ground Data Processing System
GEOTAIL	Geomagnetic Tail Laboratory
GGS	Global Geospace Science
GISR	Greenland Incoherent Scatter Radar
GMT	Greenwich mean time
GOES	Geostationary Operational Environmental Satellite

GOLF	Global Oscillations at Low Frequencies
GSE	Geocentric Solar Ecliptic
GSFC	Goddard Space Flight Center
GSM	Geocentric Solar Magnetospheric
GTDM	generic time-division multiplexed
HEP	high-energy particles
HF	high frequency
HYDRA	Fast Plasma Analyzer
IBM	International Business Machines
ICD	interface control document
ID	identifier
IDU	information data unit
IEEE	Institute of Electrical and Electronics Engineering
IMC	Ionospheric-Magnetospheric Coupling
IMSL	International Mathematics and Statistics Library
IMSS	InfoLAN Mass Storage System
InfoLAN	IPD local area network
I/O	input/output
IPD	Information Processing Division
IPLOT	ISTP Plotting System
ISAS	Institute of Space and Astronautical Science
ISO	International Organization for Standardization
ISTP	International Solar-Terrestrial Physics
kB	kilobyte
kbps	kilobits per second
KPGS	key parameter generation software
LACN	local area computing network
LAN	local area network
LANL	Los Alamos National Laboratory
LASCO	Large-Angle Spectrometric Coronograph
LEP	low-energy particles
LF	line feed
LVO	label-value object
LZ	level zero
mag	magnetometer
MAG	Fluxgate Magnetometer
MARIA	Magnetometer and Riometer Array
MB	megabyte
Mbps	megabits per second
MCE	Multicoordinate Ephemeris
MDI	Michelson Doppler Imager
MFE	Magnetic Field Investigation
MFI	Magnetic Field Investigation
MGF	magnetic field
MOSDD	Mission Operations and Systems Development Division

MPA	Meridian Photometer Array
ms	millisecond
µsec	microsecond
MSFC	Marshall Space Flight Center
MVS	multiple virtual storage
NAG	numerical algorithms
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NRT	near-real time
NSI	NASA Science Internet
NSN	NASA Science Network
NSP	Network Services Protocol
NSSDC	National Space Science Data Center
OSI	Open Systems Interconnection
PACE	Halley Station Polar Anglo-American Conjugate Experiment
PARL	Lockheed Martin Palo Alto Research Laboratory
Pacor II	Packet Processor Data Capture Facility II
PEACE	Plasma Electron and Current Experiment
PI	principal investigator
PIXIE	Polar Ionospheric X-ray Imaging Experiment
PLA	Plasma Investigation
POLAR	Polar Plasma Laboratory
PWI	Plasma Wave Instrument
Q/A	quality and accounting
RA	Restricted ASCII
RAPID	Imaging Energetic Particle Spectrometer
RDAF	remote data analysis facility
RID	review item disposition
RIO	riometer
SABR	Sabre VHF Radar
SAKK	Saskatoon-Kapusking
SAMPEX	Solar Anomalous and Magnetospheric Particle Explorer
SDPF	Sensor Data Processing Facility
SDR	SOHO Daily Report
SESAME	Satellite Experiments Simultaneous with Antarctic Measurements
SFDU	standard formatted data unit
SIRIUS	Scientific Information Retrieval Integrated Utilization System
SL	Solar-Terrestrial Environment Laboratory, Nagoya University
SMS	Solar Wind Suprathermal Ion Composition Studies
SOHO	Solar and Heliospheric Observatory
Sondrestrom	Sondre Stromfjord Radar
SPA	Synchronous Orbit Particle Analyzer
SPAN	Space Physics Analysis Network
SPHA	spin phase attitude data
SPOF	Science Planning and Operations Facility

SS	substorm simulation
STAFF	Spatio-Temporal Analysis of Field Fluctuations Experiment
SUMER	Solar Ultraviolet Measurements of Emitted Radiation
SWAN	Solar Wind Anisotropies
SWE	Solar Wind Experiment
SWIM	Solar Wind Interplanetary Mission
SWMC	Solar Wind Magnetospheric Coupling
TBD	to be determined
TBS	to be supplied
TCF	time correlation file
TCP/IP	Transmission Control Protocol/Internet Protocol
TED	Total Energy Deposition
TGRS	Transient Gamma Ray Spectrometer
TI	theory investigator
TIDE	Thermal Ion Dynamics Experiment
TIMAS	Toroidal Imaging Mass-Angle Spectrograph
TLVO	type-length-value-object
UCB	University of California, Berkeley
UCLA	University of California, Los Angeles
UTC	universal time coordinated
UVCS	Ultraviolet Coronal Spectrometer
UVI	Ultraviolet Imager
VAX	virtual address extension
VELOX	VLF/ELF Logger Experiment
VHF	very-high frequency
VIRGO	Variability of Solar Irradiance Gravity Oscillations
VIS	Visible Imaging System
VMS	Virtual Memory System
VOLDESC	volume description file
WAVES	Radio Plasma Wave Instrument
WHISPER	Sounder and High-Frequency Wave Analyzer Experiment
WIND	Interplanetary Physics Laboratory Mission

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