PLANETARY DATA SYSTEM VERSION 1.0
SYSTEM SPECIFICATION

Revision 1.0

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1 Introduction

This System Specification Document specifies the system functionality for Version 1.0 of the Planetary Data System (PDS). The Planetary Data System (PDS) is being developed under the joint sponsorship of the NASA Office of Space Science and Applications (OSSA), Information Systems Office, (ISO, Code EI) and the Solar System Exploration Division (SSED, Code EL). The goal of the PDS is to support the planetary science community by providing an easily accessible archive of planetary science data, and information about that data. It is part of a general plan to improve the management and distribution of existing and future data sets in Earth and space sciences.

This section of the PDS System Specification Document provides an overview of the document. It is intended to serve as an executive summary and to provide insight into the scope of the document. Section 2 provides a list of applicable documents. Section 3, Requirements, makes up the main body of the document. This section provides with a System Definition (3.1) followed by sections describing the decomposition and functionality of System Functions (3.1.4). This is followed by a description of Configuration Allocation (3.1.5), Interface Requirements (3.1.6), Processing Resources (3.3), Quality Factors (3.4), and Logistics (3.5). The remainder of the document addresses Qualification Requirements (4), Preparation for Delivery (5), and Acronyms and Abbreviations (6).

Appendices of this document include Data Flow Diagrams (A) which provide a graphic representation of the system, a Data Dictionary (B) which describes all data flows and data stores referenced in the System Functions (3.1.4) section, and a dictionary of PDS Version 1.0 Data Sets (C) that will be included in PDS Version 1.0.

1.1 Scope

The scope of this document is limited to Version 1.0 of the PDS to be implemented in FY '87. See Section 3.1.2 for a discussion of the three successive versions of the PDS.

1.2 Purpose

The purpose of this document is to define the system requirements for the operational Planetary Data System (PDS) Version 1.0. These system requirements were derived from user requirements as described in the PDS User Requirements Document (see Applicable Documents (2)). Since the PDS is intended to be evolutionary rather than revolutionary, requirements for Version 1.0 must be stated in the context of the overall requirements for the fully operational PDS. The system requirements for the fully operational PDS (Version 3.0 and beyond) will be contained in the PDS Final Version System Model (see Applicable Documents (2)).

1.3 Audience

The intended audience for the PDS System Specification includes three groups of people:

1. **Version 1.0 Users.** The Version 1.0 users consist of approximately 20 scientists and support personnel at the six prototype discipline/data nodes and the central node. The primary concern of this group is that the specified system satisfy their user requirements.

2. **Version 1.0 designers.** The Version 1.0 designers consist of approximately 8 technical and managerial personnel people located at JPL. This group may also include personnel at the prototype discipline nodes described above who provide design input. The primary concern of this group is that the system specification be detailed enough to proceed with the system design.

3. **Associated management.** The associated management consists of approximately 10 managers at NASA and JPL. The primary concerns of this group are that the specified system satisfy the needs of the users, be feasible to develop, be developed on schedule, and within budget.

1.4 Background

During the last twenty years, NASA has conducted a planetary exploration program which has resulted in data being generated about the Moon and the planets other than Earth and their satellites. More than one hundred experiments have produced data sets that cannot be replaced or remeasured at the same conditions as the original data sets. The data sets represent a national resource and therefore should be preserved. Data are continuing to be generated about planetary missions. This data should not only be preserved for the future but also should be disseminated to the planetary community concurrently for evaluation and analysis.

While planetary exploration missions are in their active, intense phase, significant attention is directed toward the capture, analysis, and preservation of the science data that are being returned from the mission. When this active, mission-directed phase of scientific investigation has ceased, the resources available to manage and preserve the data diminish. The data from these missions then become difficult to locate, access, and use for several reasons.

The location of the data sets needed by the scientist who is investigating planetary phenomena is sometimes difficult to ascertain. While there are some central repositories of data (e.g., National Space Science Data Center (NSSDC)), often not all of the useful data resides there. Other data sets reside in federal storage facilities or in uncontrolled, poorly maintained vaults. Some reside with principal investigators from past missions or research groups which have a particular interest in the data. Even if a scientist can determine where the gross collection of data is located, it is hard to find the particular limited subsets of the data which the scientist will actually need to examine. In many cases, the scientist needs some cursory, exploratory, summary level examination of the data in order to determine its suitability for the phenomena he is attempting to investigate. This browse capability is very difficult to achieve today.

The data from the planetary missions is not in a uniform standard format. In order to interpret the data, a scientist must have some means for knowing how the data are stored on their storage media. Usually there is inadequate or inaccessible documentation of these formats. In addition, the sequence of processing done in the reduction and transformation of the data has not been adequately recorded. Just as the data do not have a standard format, so the processing itself does not have uniform standards associated with it. In many cases, conversations, if possible, must be conducted with the original investigators to determine what processing has been done on the data.

In some cases, the data are not well preserved. The physical media on which the data are recorded are in a state of decay. As an example, there are some magnetic tapes which can only be read one more time. The metallic oxide which contains a representation of the data will be permanently damaged or destroyed by the reading process. It is essential to find a way to transfer the data which is recorded on these media to more stable media.

The types of scientific investigations which have been conducted in the past with planetary data are different from those being conducted today. In the past, the investigations focused on phenomena which could be understood by using one data set or a rather limited set of data. The format and nature of the data were guided by the needs and requirements of these experiments. Today, correlative research and interdisciplinary studies are being conducted as both the volume and breadth of planetary science data increase. This requires the comparison and combination of what would have originally been considered diverse data sets into one comparable format. In order to do this, an accurate understanding of the data sets involved is needed and this understanding is not particularly easy to obtain.

There have been two tasks which have attempted to address the "data problem" for the planetary science community. The first was the Pilot Planetary Data System (PPDS) project. This project was sponsored by NASA's Code EI. The second was the Planetary Data System (PDS) project. This project was sponsored by NASA's Code EL. These two activities have now been combined into one project and the name of the project is the Planetary Data System Project. By combining the two projects, a leveraging effect has been achieved, increasing the productivity of the resources available to each one prior to this merger.

The purpose of PPDS was to explore advanced information system technologies and to evaluate techniques and methodologies for use by planetary scientists in performing their scientific investigations. PPDS was not intended to look at all planetary data. PPDS personnel looked at only representative subsets of the vast amount of planetary data in order to drive and exercise system concepts and prototypes. The data to be examined was determined by the interest of those scientists participating in the PPDS.

The purpose of the PDS effort prior to the merger was to study the requirements for an operational Planetary Data System. This work was being performed primarily by the Planetary Science Data Steering Group with support from the Science Applications International organization. A workshop was held in late 1983 at which the first in a series of requirements documents for an operational Planetary Data System was produced. These particular documents described a top level view of a rather comprehensive data system. The current PDS task is implementing a more detailed, albeit limited, view of this same concept.

1.5 Conclusions

The system requirements for Version 1.0 of the Planetary Data System are a subset of the requirements that are expected to be used for the construction of the final Planetary Data System. Much of the functionality in the final system, which will be implemented via automated means then, will be implemented now in Version 1.0 via more manual means. Also the functionality present in Version 1.0 will be located primarily at the central node of the PDS.

The central node of Version 1.0 of the PDS is the principal focus of the system requirements. The operation of the central node will be automated, at least in the user interface to the system and especially to the catalog system. Some other aspects of the central node function, especially in the areas of data delivery and distribution, will be manual processes.

The following points present a top level summary of the requirements of Version 1.0:

1. There shall be a comprehensive high level catalog at the central node for use by all specified planetary science discipline nodes.

2. The catalog shall be populated with high level information regarding all specified planetary science disciplines.

3. The basic portion of a complete and consistent user interface shall be used at the central node. If remote discipline nodes participate in the system, lesser effort will be available to ensure that the user interface there is as fully functional as the interface at the central node.

4. There shall be two detailed level catalogs implemented at the central node.

5. There shall be remote access, via high speed and dial up communication networks, to the central node computer.

6. To the maximum extent possible, data sets that can be identified by an examination of the PDS Catalog shall be able to be obtained from the central node or from a remote node.

7. Data set restoration activities shall be performed on by the prototype discipline nodes and shall be incorporated into the PDS catalogs as they are completed.

8. The mission interface shall be established and the top level standards for the interface between the PDS and the mission/SFOC activity shall be constructed.

2 Applicable Documents

The following documents provide focus or context for the operational Planetary Data System. In general, they have been prepared by planetary scientists or else reflect the views of planetary scientists.

1. "Data Management and Computation - Volume 1: Issues and Recommendations," Committee on Data Management and Computation, Space Science Board, Assembly of Mathematical and Physical Sciences, National Research Council, National Academy Press, Washington, D. C., 1982.

2. "Data Management and Computation - Volume 2: Space Science Data Management Units in the 1980's and 1990's," Committee on Data Management and Computation, Space Science Board, Assembly of Mathematical and Physical Sciences, National Research Council, National Academy Press, Washington, D. C., 1985.

3. "Solar-Terrestrial Data Access, Distribution, and Archiving," Joint Data Panel of the Committee on Solar and Space Physics, Commission on Physical Sciences, Mathematics, and Resources, National Research Council, National Academy Press, Washington, D. C., 1984.

4. Acton, Charles, "Navigation Ancillary Information Facility Project Plan," JPL Internal Document, February 11, 1985.

5. Devirian, Michael, "Program Plan for the Pilot Planetary Data System," NASA Internal Document, May 11, 1983.

6. Kieffer, Hugh H., "Planetary Data Workshop, Volumes 1 and 2," NASA Conference Publication 2343, NASA, Washington D. C., 1984.

7. Renfrow, J. T., "Planetary Data System Project Plan," JPL D-3492, May 2, 1986.

8. "Planetary Data System Concept," Planetary Science Data Steering Group, National Aeronautics and Space Administration, Solar System Exploration Division, February 24, 1986.

9. "Planetary Data System User Requirements Document," PDS System Design Team, JPL D-3493, May 27, 1986.

10. "Planetary Data System Final Version System Model," PDS System Design Team, JPL Internal Document, May 23, 1986.

11. "Planetary Data System Software Management Plan," JPL D-3487, to be released.

12. "Planetary Data System Configuration Management Plan," JPL D-3488, to be released.

13. "Planetary Data System Software Product Assurance Plan," JPL D-3489, to be released.

14. "Planetary Data System Task Implementation Plan," JPL D-3503, to be released.

15. "Planetary Data System System Integration and Test Plan," JPL D-3494, to be released.

16. "Planetary Data System Acceptance Test Plan," JPL D-3495, to be released.

17. "Planetary Data System System/Subsystem Functional Design Document," JPL D-3496, to be released.

18. "Planetary Data System Software Specification Document," JPL D-3497, to be released.

19. "Planetary Data System Software Interface Specifications," JPL D-3498, to be released.

20. "Planetary Data System User's Guide," JPL D-3500, to be released.

21. "Planetary Data System Release Description Document," JPL D-3499, to be released.

22. "Planetary Data System Transfer Agreement," JPL D-3501, to be released.

23. "Planetary Data System Operations Plan," JPL D-3502, to be released.

24. "Planetary Data System Data Administration Plan," JPL Internal Document, to be released.

3 Requirements

The Requirements section contains the functional performance and design requirements for the system. Specifically, the topics to be discussed are listed below.

1. The functional areas of the system, and the principal interfaces between and within each functional area.

2. The definition of the principal interfaces between the system being specified and other systems with which it must be compatible.

3. The design constraints and standards necessary to assure compatibility of system hardware and software.

4. The allocation of performance to, and the specific design constraints peculiar to, each functional area.

5. The performance requirements related to manning, operating, maintaining, and logistically supporting the system, to the extent these requirements define or constrain the design of system equipment.

3.1 System Definition

The System Definition section incorporates (directly or by reference) system engineering documentation (specific products of system engineering and system analysis) which graphically portray the relationship of the system components to be developed. The following areas will be identified:

1. The functional areas of the system

2. The individual hardware and software configuration items which must be developed. Essentially this is a translation of operational requirements into development tasks.

3.1.1 Mission

The overall objectives of the PDS are to serve as a curator of planetary data, providing both increased longevity of data and knowledge of their meaning, and to improve the organization of and access to these data in order to facilitate scientific investigation and analysis. A more specific goal is to archive and present these data in such a way that in-depth knowledge of the original investigation is not required to use the data set. Other goals are to allow easy selection of data which meets user-specific constraints, provide useful presentations of those data, and distribute data in an effective and efficient way.

3.1.2 PDS Successive Versions

The operational PDS will be developed in three successive versions. At the end of each development cycle, an operational PDS will be delivered to the user community. PDS version 1.0 will be delivered after the first development cycle, PDS version 2.0 after the second cycle, and PDS version 3.0 after the third cycle. The PDS version 3.0 is planned to include the majority of the functionality necessary to satisfy all the user requirements given in the User Requirements Document (see Applicable Documents (2)). Version 2.0 will have a subset of the version 3.0 functionality. Version 1.0 will have a limited set of functions. The following sections describe the system concept and implementation philosophy for each version.

PDS Version 1.0

1. Design the structure (logical and conceptual models) for a high-level catalog at the central node for use by ALL prototype discipline/data nodes and the community.

2. Implement the design for the high-level catalog and populate the database with planetary science data (for structures defined in 1 above).

3. Design and develop the basic portion of a solid, consistent user interface, both at the central node and, as feasible, at the prototype discipline/data nodes.

4. Develop a detailed-level catalog at the central node for discipline-specific data provided by two prototype discipline/data nodes, namely imaging (Regional Planetary Imaging Facility) and fields and particles (F & P).

5. Implement the design for the detailed-level catalog and populate the database with data (for structures defined in 4 above).

6. Provide remote access to the PDS central node computer.

7. Provide limited (and perhaps non-automated) data distribution capability.

8. Plan and coordinate the data set restoration activities of the prototype discipline/data nodes, and the integration of these data sets into the PDS operational data.

9. Descope functional capability, as necessary, to deliver by end of FY'87.

PDS Version 2.0

1. Select some of the actual discipline nodes, sub-nodes, and data nodes which will be part of the distributed, integrated PDS system.

2. Refine the high-level catalog and develop a detailed-level catalog at the central node for each of the discipline nodes.

3. Implement the design for the detailed-level catalogs and populate the database with planetary science data (for structures defined in 2 above).

4. Assist two of the discipline nodes, possibly Fields and Particles and Regional Planetary Image Facility, in the development of their own detailed-level catalogs on their own hardware/software system.

5. Orchestrate the access to the two selected discipline nodes and assure a common user interface and design.

6. Continue to plan and coordinate the data set restoration activities of the discipline nodes, and to oversee the integration of actual science data into the PDS.

7. Refine the data distribution and the system management capabilities, including limited accounting procedures.

8. Select a site for a "deep" archive for PDS data. Establish and integrate the interface between PDS and the data archive facility.

9. Refine and develop the remaining portion of the user interface.

10. Provide a reliable network or communication path for users to access the discipline nodes "in a transparent fashion".

11. Use software cost models to determine a reasonable delivery date for implementing the above functional capability. (FY'89 ?)

PDS Version 3.0

1. Assist the remaining discipline nodes in the development of their own detailed-level catalogs on their own hardware/software system.

2. Orchestrate the access to the remaining discipline nodes and assure a common user interface.

3. Incorporate an integrated browse capability and graphics capability into the PDS System.

4. Refine the user interface and data presentation capability.

5. Establish and implement systematic user accounting/charging procedures.

6. Refine data duplication and distribution capabilities, as well as the system management capability, based on feedback from the user community.

7. Continue to coordinate with the discipline nodes to add science data to the PDS system.

8. Incorporate a limited data analysis capability into the PDS System.

9. Use software cost models to determine a reasonable delivery date for implementing the above functional capability. (FY'92 ?)

3.1.3 System Functional Overview

The PDS will restore, catalog, archive and distribute planetary data from past, on-going and future planetary missions. Its purpose is to allow planetary scientists to identify data which can be used for correlative studies by providing interactive access to catalogs about the planetary data. Users will be able to query the catalog database, manipulate any on line data and place an order for specific data sets.

The PDS is based on the concept of a central node and a distributed set of discipline-specific processing nodes. This concept of distributed Space Science Data Management Units (SSDMU) all supporting a central data catalog is based on the CODMAC Reports (Refs. 1 and 2). The PDS will consist of a central node, possibly located at JPL, which will contain both high-level and some detailed level catalogs of planetary data from four scientific disciplines. The four disciplines are as follows:

1. Fields and particles

2. Planetary atmospheres

3. Planetary geology

4. Planetary rings

The final PDS high-level catalog will contain entries regarding the missions, spacecraft, instruments, planetary target bodies, planetary science features and regions, principal investigators, and bibliographic and other ancillary information included in the PDS. The PDS will include scientific data from instruments aboard spacecraft from the Mariner, Pioneer, Viking, and Voyager missions as well as earth based instruments.

The PDS detailed-level catalog will contain entries describing the planetary data for each of the four disciplines listed above. Its primary purpose is to tell scientists not only **what** specific data exists but **where** to order it.

The PDS system description presented in this document is presented from four different viewpoints:

1. An external view

2. A configurational view

3. A functional view

4. An operational view

Taken together, these viewpoints present a fairly complete high-level view of the PDS system concept. The external view considers the inputs, outputs, and functions the system performs and does not concern the internals of the system. The next three views represent internal system views. The configurational view presents the logical architecture of the system. The functional view presents the functions of the PDS and their inter-relationships. The operational view discusses the scenarios of how the system will be used.

The PDS must be able to deal with planetary data from the following three sources:

1. Completed missions

2. Research groups

3. Ongoing missions

Data from the first source, completed missions, already exists in some archive facility and must be transferred and ingested into the PDS. The second source is research groups who are reprocessing existing data sets (i.e., producing evolving data sets) because new algorithms have been developed or because additional information has been learned about the data. The last source of data is ongoing planetary missions. Each data source presents different challenges to the PDS.

Challenges associated with data from completed missions are data restoration and data interpretation. The people who originally were familiar with the data sets are sometimes difficult to locate. Also, original documentation is often difficult to locate.

Data from research groups involves evolving data sets and consist of many versions of or refinements to the same original data set. Very accurate records of the various algorithms that have been applied to these data sets must be kept. Coordinating these data sets with the appropriate versions of supplementary data records is also a challenge.

Finally, challenges associated with data from ongoing missions arise because of the newness of the data. The mechanism for transferring the data from the mission personnel to the PDS Project must be determined for each mission. The Mission Interface of the PDS must generate standards and procedures for these transfer mechanisms which will be tailored to the specific needs of each mission. The task of controlling who can gain access to the data is significant. The generation of catalog information for the data must be coordinated with the mission personnel. The revisions or reprocessing done to the data must be reflected in the system. This new data is in a much more dynamic state than that data coming from completed missions.

Once the data has been incorporated into the PDS, the types of activities that are performed on it are independent of the source of the data. Both high-level and detailed catalogs, as well as data archives, shall be built from the data. Data catalogs shall be accessed as the first step in the data access and examination process. Finally, the data will be browsed, presented in different forms to the user, and then delivered to the user to process and analyze.

3.1.3.1 External View

The external view of the system is characterized by the inputs to the system and the outputs that result from the system. This view is presented in diagram CSD 0 (A.1).

The inputs to the system come from on-going missions and from already existing data stores or archives. The other major system inputs will be the user queries and commands. In addition to these standard inputs, other inputs may include the results of scientific investigations. These may include significantly reduced data sets which are transformations or refinements of the original data sets. There will also be corrections and updates to the existing data sets or the ancillary data sets. The PDS must develop mechanisms for incorporating these updates and corrections into what may appear to some to be a very static data base.

The outputs from the system are primarily either the data presented to the user in some refined form in response to a query or command, or else a subset of the raw data set selected by the user. The output from queries may be catalog information, summarizations of data, and data presentation products (i.e., graphics, image overlays). The actual data outputs will be the specified subsets of the data that the user needs. In addition to data, the system will distribute, to some limited extent, software for data management, presentation, and analysis for use with the delivered data sets.

3.1.3.2 Functional View

The functional view of the system, presented in DFD 0 (A.7), shows the flow of data through a system and the functions acting on this data.

It does not, unlike flow charts, show the flow of control through the system. It shows the major data flows between the major functional components. Since this is a logical representation of functions and data, this diagram does not distinguish between work done at the central node and work done at the discipline node. The "data" mentioned in the data flows can consist of scientific data of several different levels of processing from raw to calibrated and resampled, as well as histories, bibliographies, guides, on line and off line documentation, etc. The "data" can also consist of information such as queries to the catalog or user requests for data.

The functional components of the PDS are:

1. Access System - This functional component manages the interaction of the user with the system. It controls the communications function for the user. It is also the interface to the data inspection function, and to the data ordering function. The bulk transfer of data to and from the user is handled here also.

2. Inspect Data - This functional component allows the user to retrieve catalog, sample, summary, and science data via either menu responses or query commands. In addition, the user can manipulate and display the retrieved data via either a menu or command interface. Help facilities are provided in both menu and command modes.

3. Order Data - This functional component validates a data order, locates the ordered data, and determines if the order can be filled immediately on line or must be routed to be filled manually. Both types of orders are then sent to the distribution function.

4. Distribute Data - This functional component distributes data orders. Data orders can be handled automatically or manually. If a data order can be handled automatically, the data is retrieved immediately and distributed via communication links. If the order cannot be handled automatically, it is processed manually and shipped in the most cost effective manner.

5. Administer System - This functional component manages all the functions not directly involved with data inspection, data ordering, or data distribution. This includes the areas of customer support, facilities management, planning and scheduling, accounting, and database administration.

6. Prepare Data - This functional component manages the receipt of data from outside sources such as planetary missions and data restoration activities. It performs quality control checks on the data. These quality control checks are controlled by the planetary science community. If errors are detected that can be corrected internal to the PDS, then the corrections are performed. If the errors cannot be cost effectively corrected, the data is returned to the sender.

3.1.3.3 Configurational View

The configurational view shows a distributed system consisting of a central node, six Prototype discipline nodes logically and physically separated from the central node, and several manually performed system functions. The nodes can communicate with each other via a communications network. The manual functions are performed at the central node. This view is depicted in the configuration view diagrams CVD 0 (A.2), CVD 4 (A.3), CVD 8 (A.4), and CVD 9 (A.5). The top level view of the configuration is shown in CVD 0 (A.2). CVD 1 (A.3), CVD 2 (A.4), and CVD 4 (A.6) show , in more detail, the central node, a prototype discipline node with a Britton Lee database machine, and a prototype discipline node without a database machine respectively.

The central node is responsible for coordinating among all the other nodes. It maintains information on the configuration, capabilities, and resources of the other nodes. It determines the standards and practices for the entire system. It is the location of the high level data catalog and contains summary, sample, and science data as well. The data catalog contains information describing the location of any data resident in the system. It does not necessarily contain all the full and complete data sets, since some of those may be kept at the discipline nodes.

The prototype discipline/data nodes correspond to the Space Science Data Management Units (SSDMU) referred to in the CODMAC Reports. Detailed level catalogs (i.e., discipline specific) will be maintained at these nodes. Refined or reduced or reprocessed data sets will be at these nodes. The criteria used for the clustering of the data sets will be along discipline lines. The discipline nodes will be capable of performing specialized processing on their data. There will be experts at the discipline nodes who will know the processing history of the data sets, and who can assist the user in understanding and interpreting these data sets. Some data nodes will be attached to some discipline nodes. These data nodes will be actively working on the transformation or improvement of a single data set. These data nodes need not be at the same institution as the associated discipline node but they will be working under their guidance. The results of their work will be given to the discipline node and the central node for quality checking.

The communications mechanisms that will be used to connect these nodes will evolve over time as the system matures throughout the successive versions. These may include dedicated communications capabilities or dial up communications capabilities established on an as needed basis. Initially the lines will operate at either 1.2 or 9.6 Kbps. The Space Physics Analysis Network (SPAN) will be used in most cases. Eventually ISO Protocols will be used and the backbone network will be implemented by NASA's Program Support Communication Network (PSCN).

The user will be able to access the PDS via the four different routes described below:

1. He can access the system by being at either the central node or a discipline

node and using a terminal which is connected to the PDS host computer(s).

2. He can be at his home institution and access the system via SPAN if his institution is connected to the SPAN network.

3. He can access the system via Telenet, a public packet switching network.

4. He can dial directly into the PDS using direct dial lines and modems.

In the initial versions of the PDS, the user most likely will have to manage the connection and switching of connections between the central node and the discipline nodes. Eventually, all the communications routing will be transparent to the user.

3.1.3.4 Operational View

The operational view of the system can be characterized by two major transactions:

1) the identification and ordering of planetary data by the user

2) the archiving of planetary data by the system.
These two transactions are described below.

Transaction 1

The data identification and ordering transaction begins when the user initiates communication from his or her terminal to the system. Once the user has accessed the PDS, he or she may choose the data inspection function. Interaction with the data inspection function is accomplished via either a hierarchical menu structure or a command language. Using either the menus or the command language, the user may begin to examine the planetary data, which is organized by observations, and to determine what data is needed.

The second step, if the user is unfamiliar with the data sets, is for the user to interact with the catalog system to find out general or discipline specific information about data.

The third step is for the user to examine the characteristics of the data in more detail. This is done by retrieving detailed catalog, summary, and sample data and displaying tabular, graphical, and pictorial representations of the data. In addition, the user may perform simple data manipulation and display processing to provide additional insights into the characteristics of the data.

The fourth step is for the user to place an order for the desired data. The order states the delimiting parameters and the conditions (time, location, parameter value, etc.) to be satisfied by the data.

The fifth step is for the PDS system to examine the data order to see how it can be filled. If the ordered data is on line or near on line at the central node, the data will be retrieved and sent via communication links immediately. If the ordered data resides at the central node but cannot be retrieved for immediate distribution, a order is printed for manual processing. If the ordered data does not reside at the central node, an order is generated and relayed to the appropriate node for manual processing and distribution.

The last step is for the PDS system to issue an order confirmation which states that

an order has been filled. This concludes the transaction.

Transaction 2

The data archiving transaction begins with a solicitation for data issued by the PDS Administer Data function and sent to a potential data supplier. The data solicitation contains the PDS data submission standards and requirements. If the solicitation is accepted, a memo of understanding (MOU) is issued and the data supplier begins preparing the data set for submission.

The first step involves the preparation and tailoring of both the data format and the data catalog standards for the particular data set that is being delivered to the system. The data restoration activities that will be funded will have undergone peer review.

The second step involves the actual preparation of the data according to the agreed upon standards. The material that is prepared will need to have enough information in it about the data set so that the catalog information can also be generated. Some translation or processing by the PDS may have to be done so that this information can be obtained. This processing should be as minimal as feasible.

The third step occurs when the data is received by the PDS. It is validated using procedures developed by the planetary science community. If correctable errors are detected, then the data is accepted into the system and the corrections are made. If the data does not pass the quality control function, then the data is returned to the originator.

The final step in the data archiving process is the storing of the data and associated information and pointers into the PDS Operational Database and the Planetary Data Archive.

3.1.4 System Functions

The following sections describe the six high level functional areas of PDS version 1.0 in more detail. Within each section, a functional area is decomposed into sub-functions, then the sub-functions are described in sub-sections in a recursive manner until the most primitive functions are reached. The level of detail in a functional description will be abstract at the top levels and more detailed at the lower levels. However, the organization of a section describing a functional component is the same regardless of the function's level in the functional decomposition hierarchy.

Each section describing a functional component starts with a section title which consists of the function name and its synonym. The synonym is a label used in the structured analysis methodology to identify the level and parent of a function in DFDs (refer to Data Flow Diagrams (A) in the Appendix). The section text begins with a description of the function. At the end of the textual description is a statement that refers to the DFDs in which the function appears. Next is a list of inputs to the function and the source of the inputs. Next is a list of outputs from the function and the destinations of the outputs. The outputs are followed by a list of data stores (files or some repository of data) which are read, written, and updated by the function. All of the inputs, outputs, and data stores referred to in the lists are fully described in the Data Dictionary (B) in the Appendix.

3.1.4.1 Access System - F-1

The Access System function shall provide all services necessary to permit authorized users to have electronic or on line access to the PDS. Other PDS functions shall interface to users via this function or non-electronically. The latter are covered in the sections dealing with the Prepare Data (3.1.4.6) and Administer System (3.1.4.5) functions.

Within the Access System function there are three ways that the PDS shall electronically interface with users:

1. Interactive access

2. Electronic file transfers

3. Electronic mail transfer

Interactive access shall support the terminal user who enters User Input (B.187) and receives System Responses (B.169). These inputs relate to all functions including the display of catalog or science data, data manipulation, and system support. Electronic file transfers shall be used to transfer planetary data to users in conjunction with the Order Data (3.1.4.3) function. Electronic file transfers shall be an alternative to physical delivery of data on some machine readable media. Electronic mail shall be used to send and receive informative messages to and from users who may not be physically connected to the PDS.

The support of the physical and logical communication functions within Access System shall be provided by the Support Communications (3.1.4.1.1) function. Included in this category are system security functions which shall insure that only authorized users shall have access to the PDS.

Most processing within Access System shall be initiated by an interactive user input. In all cases a User Input (B.187) shall result in System Responses (B.169). Some user inputs related to communications are handled within the Access System function. Examples of these are requests for menus, requests for HELP, and electronic mail services. Other user inputs are routed to other functional areas (e.g., Inspect Data (3.1.4.2), Order Data (3.1.4.3), and Distribute Data (3.1.4.4)) for action and generation of responses.

For all functions the High Level User Interface (3.1.4.1.2) function shall provide services for the interactive user which shall insure that the user shall be able to request desired data or perform the desired function in a convenient manner with as much assistance as is required. The PDS shall interact with the user in a consistent manner for all functions. The user interface shall support menus for use by novice users. For more expert users, a command language shall provide greater flexibility and directness. At all levels, assistance in the form of HELP information shall be available.

The Distribute Data (3.1.4.4) function shall request that certain data be electronically distributed to users. The Transfer Data (3.1.4.1.3) function shall perform all activities required for the electronic transfer of that data to the user's site.

All functions shall have the capability to distribute textual messages to users. Since these users may not be electronically or logically connected to the PDS when the message is generated, the Transfer Data (3.1.4.1.3) function shall support an electronic mail facility

for the exchange of such messages. (Refer to Data Flow Diagrams: DFD-0)

Inputs:	**From:**
User Input	PDS Users
Inspect Data Responses	Inspect Data
Data for Display	Inspect Data
On Line Data Distribution Requests	Distribute Data
Order Data Responses	Order Data
Outputs:	**To:**
Inspect Data Commands	Inspect Data
Order Data Commands	Order Data
System Responses	PDS Users
Data Files for On Line Distribution	PDS Users

3.1.4.1.1 Support Communications - F-1.1

The PDS shall support several different procedures for electronic access to the PDS by users with different communications capabilities. The Support Communications function shall handle all functions specific to communications. The support of these procedures implies both a physical capability to properly connect to users and a logical capability to perform the functions required to permit the exchange of coherent data. The physical capability shall support the specific physical and link level communication protocols. The logical capability shall support the specific procedures and data formats at the transport, session and application levels.

There shall be three main classes of logical communications support:

1. Interactive terminal support

2. Electronic file transfers

3. Electronic mail

The principal data flow through Support Communications shall consist of User Input (B.187) received from the users and the System Responses (B.169) generated by the PDS which are sent back to the user. There shall be processing functions specific to each user type which perform the physical and logical functions required to support the connection to that user. These functions are described in the following sections: Support Local Users (3.1.4.1.1.4), Support SPAN Network (3.1.4.1.1.5), and Support Dial In Users (3.1.4.1.1.6).

There shall be three classes of physical support:

1. Direct access via locally attached terminals

2. Dial in access

3. SPAN (Space Physics Analysis Network) access

Dial in access shall be provided for users to access the PDS via the public switched telephone network, the JPL ILAN (Institutional Local Area Network) and the Telenet network. Direct access shall be provided via locally attached asynchronous ASCII compatible terminals operating at speeds up 19.2 Kbps. Dial in users shall have asynchronous ASCII compatible terminals operating at speeds of 300, 1200 or 2400 bps. For users accessing the PDS through the public dialed network, Bell 202C compatible modems shall be required. Users accessing the PDS over the SPAN shall have ASCII terminals connected to VAX host computers which shall be logically connected to the PDS using the DECNET procedures of the SPAN.

Functional requirements that are common to all interactive users are described in the Support Interactive Users (3.1.4.1.1.1) section. Interactive terminal support shall allow simultaneous access of up to eight (8) users. Interactive support shall assume that each user shall have a VT100 terminal or a compatible terminal emulator. For graphic functions, the terminal must be Tektronix 4014 compatible. The terminal(s) supported for image display functions shall be selected during the system design phase.

Electronic mail functions shall be handled interactively to submit and receive mail messages.

Security for all interactive users shall be supported by the Support System Security (3.1.4.1.1.3) function. When a user requires access, the user shall provide a user name and password combination. This function shall insure that the user is properly authorized. If the user is not authorized, access shall be denied.

Interactive support shall permit the exchange of inputs entered by the user and the resultant responses transmitted by the various subsystems of the PDS. The incoming inputs received from the appropriate communication handler shall be passed to the High Level User Interface (3.1.4.1.2) function. The System Responses (B.169) received shall be returned to the same communication handler for output.

Commands relating to electronic mail shall be passed to the Process Mail (3.1.4.1.4) function. This shall result in the display of any messages waiting for that user (Outgoing Mail (B.117)) or the receipt of an incoming message from a user (Incoming Mail (B.85)). (Refer to Data Flow Diagrams: DFD-1)

Inputs:	**From:**
User Input	PDS Users
System Responses	High Level User Interface
Connection Requests	Transfer Data
Transfer Data Blocks	Transfer Data
Outgoing Mail	Process Mail
Outputs:	**To:**
User Input	High Level User Interface
Incoming Mail	Process Mail
Mail Commands	Process Mail
System Responses	PDS Users
Data Files	PDS Users

3.1.4.1.1.1 Support Interactive Users - F-1.1.1

The Support Interactive Users function shall provide the capability to permit users to connect to the PDS using interactive terminals. Although the physical connection methods may vary, interactive terminals shall be VT100 terminals or personal computers emulating VT100 terminals. These shall operate at 19,200 bps or less over asynchronous circuits. Graphic and image presentations shall also be permitted on specified graphics terminal.

Interactive access shall be controlled by a security mechanism. Interactive access shall be discontinuous. It shall be started by a connect (LOGON) procedure initiated by the user. It shall be terminated by a disconnect (LOGOFF) procedure initiated by the user. Interactive support shall permit the exchange of User Input (B.187) entered by the user and the resultant System Responses (B.169) transmitted by the PDS. (Refer to Data Flow Diagrams: DFD-1.1)

Inputs:	**From:**
System Responses	Route Input
User Input	Support Local Users
User Input	Support Dial In Users
User Input	Support SPAN Network
Outgoing Mail	Process Mail Command
Access Permits	Support System Security
Outputs:	**To:**
Access Requests	Support System Security
System Responses	Support Local Users
System Responses	Support SPAN Network
System Responses	Support Dial In Users
User Input	Route Input
Incoming Mail	Process Mail Command
Mail Commands	Process Mail Command

3.1.4.1.1.2 Support Data Transfer Protocol - F-1.1.2

The PDS shall support error checked data transfer protocols between the PDS and external systems. Two classes of protocols shall be supported:

1. Digital VAX-to-VAX data transfers across the SPAN DECNET network

2. Host-to-terminal protocols across asynchronous links

For the Host-to-terminal support, both the XMODEM and KERMIT file transfers shall be supported.

VAX-to-VAX data transfers shall occur independent of the interactive session with the user. The Support Data Transfer Protocol function shall receive Connection Requests (B.15) from the Control On Line Data Transfers (3.1.4.1.3.1) function whenever a transfer is required. These Connection Requests (B.15) shall contain all information necessary to establish the connection. An attempt to establish a connection across the network shall be made. If successful, the Support Data Transfer Protocol function shall receive Transfer Data Blocks (B.178) for transmission. If the transmission is unsuccessful or is interrupted, the Control On Line Data Transfers (3.1.4.1.3.1) function shall be notified and the transmission shall be rescheduled.

All asynchronous host-to-terminal data transfers shall occur while the user is logged onto the PDS. Normal interactive activity shall be suspended while the data transmission occurs. The user must have an appropriate transfer data entity (KERMIT or XMODEM) at his or her site. The Connection Requests (B.15) data flow specifies the destination file name and the type of data transfer protocol to be used. If a successful connection is established with the file transfer entity at the user's end, the transmission shall commence. If the transmission is unsuccessful or interrupted, the Control On Line Data Transfers (3.1.4.1.3.1) function shall be notified and the user shall be notified about the unsuccessful transmission attempt. (Refer to Data Flow Diagrams: DFD-1.1)

Inputs:	**From:**
Transfer Data Blocks	Control On Line Data Transfers
Connection Requests	Control On Line Data Transfers
Outputs:	**To:**
Transfer Data Blocks	Support Local Users
Transfer Data Blocks	Support SPAN Network
Transfer Data Blocks	Support Dial In Users

3.1.4.1.1.3 Support System Security - F-1.1.3

PDS shall provide system security. No interactive user shall be permitted access to the system unless a valid account has been assigned to them by the system administrator. A user shall be required to enter a user name and password prior to being given access to the PDS.

A PDS user shall be restricted from executing any commands or performing any function other that those which are specifically part of the PDS. The PDS shall be able to restrict certain users to certain data sets and certain functions based on a 'priority' structure and an assigned 'priority.'

The Support System Security function shall receive Access Requests (B.3) whenever a user attempts to log onto the PDS. This function shall refer to the User Profile (B.191) to verify that the user is a valid user and the entered password is also current. If the user name password pair is valid, Access Permits (B.2) shall be returned to the Support Interactive Users (3.1.4.1.1.1) function.

The Support System Security function shall generate and maintain a log of all attempts to access the PDS. (Refer to Data Flow Diagrams: DFD-1.1)

Inputs:	**From:**
Access Requests	Support Interactive Users
Outputs:	**To:**
Access Permits	Support Interactive Users
Data Stores:	**Access:**
User Profile	reads

3.1.4.1.1.4 Support Local Users - F-1.1.4

The Support Local Users function shall support users and their terminals which are directly attached to the PDS VAX computer. This function shall perform all functions specific to the supported terminals and communication pathways. VT100 terminals or personal computers with VT100 emulation operating at 19,200 bps or less over asynchronous circuits shall be supported.

The Support Local Users function shall receive User Input (B.187) from the communication medium (i.e the user's terminal) and shall pass these along to the Support Interactive Users (3.1.4.1.1.1) function. It also shall receive PDS System-Responses from the Support Interactive Users (3.1.4.1.1.1) function and shall return these to the user's terminal.

Transfer Data Blocks (B.178) shall also be transmitted to the user when received from the Support Data Transfer Protocol (3.1.4.1.1.2) function. (Refer to Data Flow Diagrams: DFD-1.1)

Inputs:	**From:**
User Input	Local Users
System Responses	Support Interactive Users
Transfer Data Blocks	Support Data Transfer Protocol
Outputs:	**To:**
User Input	Support Interactive Users
System Responses	Local Users
Data Files	Local Users

3.1.4.1.1.5 Support SPAN Network - F-1.1.5

The PDS shall support user access to the PDS VAX via a VAX host attached to the SPAN, a DECNET network. The Support SPAN Network function shall support a full implementation of DECNET. Both VT100 terminals and personal computers emulating VT100 terminals attached to the remote VAX host computer shall be supported. SPAN users shall be able to establish a virtual link to the PDS VAX by the entry of a SET HOST command. From that point, the system functionality shall appear identical to that of a locally attached user (see Support Local Users (3.1.4.1.1.4)). Delays due to network operation shall not be the responsibility of the PDS.

The Support SPAN Network function shall receive User Input (B.187) from the the user's terminal via the network virtual link and shall pass these along to the Support Interactive Users (3.1.4.1.1.1) function. It shall also receive PDS generated System Responses (B.169) from the Support Interactive Users (3.1.4.1.1.1) function and shall return these to the user's terminal.

The PDS shall also be able to connect to SPAN users for the purpose of transferring data electronically to a remote host. The Support SPAN Network function shall receive Transfer Data Blocks (B.178) from the Support Data Transfer Protocol (3.1.4.1.1.2). These shall be transmitted to the SPAN user. (Refer to Data Flow Diagrams: DFD-1.1)

Inputs:	**From:**
User Input	SPAN Users
System Responses	Support Interactive Users
Transfer Data Blocks	Support Data Transfer Protocol
Outputs:	**To:**
User Input	Support Interactive Users
System Responses	SPAN Users
Data Files	SPAN Users

3.1.4.1.1.6 Support Dial In Users - F-1.1.6

The PDS shall support users who access the PDS VAX via the public dialed, TELENET, or JPL internal ILAN networks. Either VT100 terminals or personal computers emulating VT100 terminals operating at 9600 bps or less over asynchronous circuits shall be supported. Such users shall be able to establish a link to the PDS VAX by dialing the appropriate number for the PDS computer. The Support Dial In Users function shall perform the proper protocol to answer the call and establish the connection. From that point the system functionality shall appear identical to that of a locally attached user. Limitations of the specific networks as compared with public dialed network, shall not be handled in Version 1.0. Any disconnection occurring prior to a LOGOFF, shall be reported to the Support Interactive Users (3.1.4.1.1.1) function. After a user has logged off, the dialed link shall be physically disconnected.

The Support Dial In Users function shall receive User Input (B.187) from the

communication medium (i.e., the user's terminal) and shall pass these along to the Support Interactive Users (3.1.4.1.1.1) function. It shall also receive PDS System-Responses (B.169) from the Support Interactive Users (3.1.4.1.1.1) function and shall send these back to the user's terminal.

Transfer Data Blocks (B.178) shall also be transmitted to the user when received from the Support Data Transfer Protocol (3.1.4.1.1.2) function. (Refer to Data Flow Diagrams: DFD-1.1)

Inputs:	**From:**
User Input	Dial In Users
System Responses	Support Interactive Users
Transfer Data Blocks	Support Data Transfer Protocol
Outputs:	**To:**
User Input	Support Interactive Users
System Responses	Dial In Users
Data Files	Dial In Users

3.1.4.1.2 High Level User Interface - F-1.2

The High Level User Interface function shall provide a uniform appearance to the user for all functions. Further, this function shall provide services to the user such as a HELP capability which shall aid the user in the use of the PDS. This feature shall provide both a menu driven interface for novice users and a command language interface for more experienced users.

The High Level User Interface function shall handle all communications with users except in cases where functions directly communicate with the users and deliberately bypass the high level user interface. This latter situation shall be permitted only in cases where existing software packages are incorporated into the PDS and where these packages have not been designed to interface with the high level user interface. The definition of the software packages to be used shall be made during the system design phase.

The High Level User Interface function shall act as an executive between the communication front end (Support-Communications) and three functional areas: Inspect-Data, Order-Data, and Administer System. The High Level User Interface function shall receive User-Inputs from the Support-Communication function and pass these along to the appropriate processing function. Conversely, it shall receive System-Responses from these processing functions and send them to the user. (Refer to Data Flow Diagrams: DFD-1)

Inputs:	**From:**
User Input	Support Communications
Inspect Data Responses	Interpret Inspect Commands
Data for Display	Interpret Inspect Commands
Order Data Responses	Interpret Order Commands

Outputs:	To:
System Responses	Support Communications
Inspect Data Commands	Interpret Inspect Commands
Order Data Commands	Interpret Order Commands

3.1.4.1.2.1 Route Input - F-1.2.1

The Route Input function shall receive all User-Input from the Support Interactive Users (3.1.4.1.1.1) function. The user interface shall operate in two modes:

1. Menu mode

2. Command language mode

Although menus are appropriate for the novice user, a command language is more efficient for the more expert user. The Route Input function shall determine whether User Input (B.187) is a low level command or an input related to a menu. If the input is a Command Input (B.11), it shall be routed to the Interpret-Command function. If the input is a Menu Input (B.95), it shall be routed to the Manage-Menu function. Upon initiation of the PDS, the initial display shall be the PDS introduction menu. In addition, the Route Input function shall pass all responses from the Manage-Menu and Interpret-Command functions back to the user. (Refer to Data Flow Diagrams: DFD-1.2)

Inputs:	From:
User Input	Support Interactive Users
Command Response	Interpret Command
Menu Response	Manage Menu
Help Response	Manage Menu

Outputs:	To:
System Responses	Support Interactive Users
Menu Input	Manage Menu
Help Request	Manage Menu
Command Input	Interpret Command

3.1.4.1.2.2 Manage Menu - F-1.2.2

The Manage Menu function shall display menus, allow the user to navigate through the menu hierarchy, and provide help information about allowable inputs when requested. Menu definitions and menu help information shall each be stored in data stores referenced by this function (Menu Definition (B.93), Menu Information (B.94)). The user shall be able to select one of three levels of menus corresponding to his level of familiarity with PDS procedures.

The PDS menus shall provide an alternative to a command language as a means for the users to direct the PDS to provide information or to perform some task. The menus shall be fixed format displays which provide for the user a limited number of options for further action. In addition, some menus shall act as forms allowing the user to enter information. Some options shall cause another menu to be displayed. The PDS shall have a well-defined hierarchy of menus starting with the general and descending to the specific. Some menus shall have a "run" option permitting the user to request that the system perform some action as a result of the selecting a previous menu option or data entry. Each menu shall have a HELP option which shall provide more detailed information about the menu displayed, i.e., valid data entry options, general description of purpose, etc.

The Manage Menu function shall receive control whenever the user responds to a displayed menu. The result of a menu input shall be one of four outcomes:.

1. A new menu

2. An error response indicating that the user input is incorrect

3. Help information

4. A notification to the Interpret-Menu-Input function that the user wants to "run" some executable program.

If the option selected is to "run" an executable function, then control shall be passed to an executing process, e.g. Start Process (3.1.4.1.2.5), Execute System Request (3.1.4.1.2.6), or Communicate with Process (3.1.4.1.2.7). When executing one of these processes, the PDS shall either remain in menu mode or revert to command mode depending on the design of the executing function. If the PDS remains in menu mode, any response from the executing function shall be returned to the user as a Menu Response (B.96). If the PDS does not remain in menu mode, any response from the executing function shall be returned to the user's terminal as a Command Response (B.12). (Refer to Data Flow Diagrams: DFD-1.2)

Inputs:	**From:**
Menu Input	Route Input
Help Request	Route Input

Outputs:	To:
Menu Response	Route Input
Help Response	Route Input
Menu Run Request	Interpret Menu Input

Data Stores:	Access:
Menu Definition	reads
Menu Information	reads

3.1.4.1.2.3 Interpret Menu Input - F-1.2.3

The Interpret Menu Input function shall receive a Menu Run Request (B.97) from the Manage Menu (3.1.4.1.2.2) function whenever the user has selected the run option on a menu. This function shall translate the menu into executable commands (Menu-Commands). The menu interface shall be a front-end to the command language in that every menu can be decomposed into corresponding commands. (Refer to Data Flow Diagrams: DFD-1.2)

Inputs:	From:
Help Response	Route Input
Menu Run Request	Manage Menu

Outputs:	To:
Help Request	Interpret Menu Input
Command Input	Interpret Command

3.1.4.1.2.4 Interpret Command - F-1.2.5

The Interpret Command function shall receive either Command Input (B.11) from the interactive user or from the Interpret Menu Input (3.1.4.1.2.3) function. These commands shall be interpreted and passed to the appropriate processing function for execution.

All Command Input (B.11) shall be validated for syntactical correctness. If errors in syntax are found, the Command Response (B.12) shall report the problem to the user via an error message.

Any command shall be able to reference a procedure. A procedure is a predefined set of commands. The use of procedures simplifies the entry of lengthy frequently used command sequences. These predefined procedures shall be maintained in the Procedures data store. When a procedure is referenced by a command, the corresponding procedure commands shall be substituted. Procedure parameter substitution shall also be supported. This feature shall permit the variation of the operation of a procedure based on different parameters specified in the original command. The Procedure data store shall be

maintained by the Administer System function.

All commands entered shall be stored on the Session Log (B.149). The Session Log (B.149) shall become a record of all actions taken by the user in either menu or command mode. The Interpret Command function shall permit the user to save the Session-Log and to reexecute the session at a later time. There shall also be a convenient way for the user to modify a Session Log for modified reexecution.

There shall be four classes of commands as follows:

1. Commands to start processes

2. Operating system requests

3. Requests for help

4. Commands destined for processing modules

If the command is a Command Help Request (B.9) (Command-Input only), the request shall be sent to the Manage Command Help Request (3.1.4.1.2.8) function for processing. This function shall return the requested Command Help Response (B.10) which then shall be sent to the interactive user as a command response.

If the command specifies that a new user process is to be initiated, the command shall be sent to the Start Process (3.1.4.1.2.5) function which shall initiate execution of the specified function. Further communication with that process (if any) shall be handled through the Communicate with Process (3.1.4.1.2.7) function. After the process is initiated, the Start Process (3.1.4.1.2.5) function shall return a Start Notification (B.156) to the Interpret Command function.

If the command is a native operating system command (e.g., a VAX DCL statement), the command shall be sent to the Execute-System-Request function. This function shall pass the statement to the operating system for execution. Any system response as a result of the command shall be returned to the Interpret Command function as a System Responses (B.169).

Once a process is underway, a dialogue between the user and the function shall be supported by the Communicate with Process (3.1.4.1.2.7) function. This shall permit a user to provide more information to a process (Process-Command) or for a process to respond with the requested information (Process-Response).

All executing processes shall return a response to the user within five (5) seconds after the entry of a command. The response can simply be a notification that the command shall require additional time to execute. Responses shall be either textual, graphic, or image data (depending on the capabilities of the user's terminal equipment). A process shall support either (or both) menu mode or command mode communication with the user. If the process operates in menu mode and was initiated from a menu, the response shall be returned to the Manage Menu (3.1.4.1.2.2) function as a Process Menu Response. If the process was initiated while in command mode, the response shall be returned to the user as a Command-Response. The Interpret Command function shall provide service routine functions to the executing processes to permit them to exchange information with the user. The modes (menu or command) supported by specific processing modules shall be determined during the design phase. (Refer to Data Flow Diagrams: DFD-1.2)

Inputs:	From:
Command Input	Interpret Menu Input
Command Input	Route Input
Command Help Response	Manage Command Help Request
Start Notification	Start Process
Command Response	Communicate with Process
System Request Response	Execute System Request

Outputs:	To:
Command Response	Route Input
Start Process Request	Start Process
System Request Command	Execute System Request
Interpreted Command	Communicate with Process
Command Help Request	Manage Command Help Request

Data Stores:	Access:
Procedures and Macros	reads
Session Log	reads
Session Log	writes

3.1.4.1.2.5 Start Process - F-1.2.6

The Start Process function shall receive a Start Process Request (B.157) from the Interpret Command (3.1.4.1.2.4) function to initiate processes. The PDS shall support two types of processes: temporary and asynchronous. Temporary processes shall exist only while the user is logged on and shall communicate directly with the user. Asynchronous processes shall operate independently from the interactive session and, once initiated, these processes shall have no direct contact with the interactive user. The Start Process function shall determine if the request is for the start of a temporary process or an asynchronous process and shall initiate the process in the requested mode. The Start Process function shall also determine if all information required to start the process has been specified and is correct. The Start Notification (B.156) function shall inform the user that the Start Process Request (B.157) has been accepted. Otherwise, an error response shall be sent to the user.

The PDS shall provide the capability for the user to determine the operating status of any asynchronous processes that have been started. An asynchronous process may either be pending, in progress, or completed. If it is not completed, the user shall have the option to cancel or abort the request by the entry of a System Request Command (B.165). (Refer to Data Flow Diagrams: DFD-1.2)

Inputs:	From:
Start Process Request	Interpret Command

Outputs:	**To:**
Start Notification	Interpret Command

3.1.4.1.2.6 Execute System Request - F-1.2.7

The Execute System Request function shall permit the user to request certain system functions from the operating system. These functions shall include file manipulation commands (create, delete, directory), process control commands, status requests, system configuration requests, and other operating system commands. These operating system functions shall be used by the more sophisticated users during data manipulation operations to operate on user work files.

System Responses (B.169) resulting from the execution of the System Request Command (B.165) shall be returned to the user via the Interpret Command (3.1.4.1.2.4) function. (Refer to Data Flow Diagrams: DFD-1.2)

Inputs:	**From:**
System Request Command	Interpret Command
Outputs:	**To:**
System Request Response	Interpret Command

3.1.4.1.2.7 Communicate with Process - F-1.2.8

The Communicate with Process function shall permit any initiated process to communicate with the user via the High Level User Interface (3.1.4.1.2) function. Either command or menu mode shall be used as appropriate for the executing process. This feature shall permit any process to request additional information or to return a lengthy response to the user.

Once a process has been initiated, the dialogue with the user shall be controlled by the executing process. The process shall be able to request further information from the user by sending a Command Response (B.12). The user shall send send his response as Inspect Data Responses (B.87). This arrangement shall continue until the process is finished with the requested task and terminates itself.

Any output from the executing process shall be sent as a Command Response (B.12). This output shall be in the form of either textual information, graphics output, or image output as appropriate for the user's terminal type.

PDS Version 1.0 shall permit the user to communicate with the following three functions:

1. Inspect Data (3.1.4.2)

2. Order Data (3.1.4.3)

3. Administer System (3.1.4.5)

(Refer to Data Flow Diagrams: DFD-1.2)

Inputs:	**From:**
Inspect Data Responses	Parse Command/Prepare Response
Data for Display	Parse Command/Prepare Response
Interpreted Command	Interpret Command
Order Data Responses	Interpret Command
Outputs:	**To:**
Command Response	Interpret Command
Inspect Data Commands	Parse Command/Prepare Response
Order Data Commands	Interpret Order Commands

3.1.4.1.2.8 Manage Command Help Request - F-1.2.9

The Manage Command Help Request function shall receive requests for information about command syntax and allowable parameters. The Command Help Information (B.8) data store shall be a hierarchically organized database containing successively more detailed information on syntax and parameters. Help information shall always be predefined textual information describing the purpose of a command, its method of operation, and defining allowable parameters and operands. The exact contents of the Help information data sets shall be developed during the programming and testing phases of development. The Manage Command Help Request function shall display the requested Help information as a Command Help Response (B.10). (Refer to Data Flow Diagrams: DFD-1.2)

Inputs:	**From:**
Command Help Request	Interpret Command
Outputs:	**To:**
Command Help Response	Interpret Command
Data Stores:	**Access:**
Command Help Information	reads

3.1.4.1.3 Transfer Data - F-1.3

The Transfer Data function shall manage the electronic transfer of data from the PDS to users using various error checked communications procedures.

The Transfer Data function shall receive from the Distribute Data (3.1.4.4) function On Line Data Distribution Requests (B.104). This shall define the ultimate user, the data in the Working Data Set to be transferred, the priority for the transmission, and the desired transmission method (if there are multiple pathways to this particular user).

The Transfer Data function shall schedule the transmission according to a scheduling algorithm which considers the priority of the request and the size of the data set to be transferred. The larger the data set to be transferred, the lower the urgency accorded to the transmission. There shall be three priorities for data transmission:

1. Immediate. Transmission shall begin within 10 minutes.

2. Priority. Transmission shall occur at a rate so as not to impact other system activities within hours.

3. Normal. Transmission shall occur during network off hours (nights and weekends). The transmission may be discontinuous (i.e., broken up into separate segments).

In the case of VAX-to-VAX transfers, the Transfer Data function shall perform a Copy function across the network. If the copy is interrupted, it shall automatically be restarted. In the case of normal priority transmissions, the transfer shall be segmented if the data set is sufficiently large, i.e., greater than 500 Kbytes. (Refer to Data Flow Diagrams: DFD-1)

Inputs:	**From:**
On Line Data Distribution Requests	Distribute Data Online
Outputs:	**To:**
Connection Requests	Support Communications
Transfer Data Blocks	Support Communications

3.1.4.1.3.1 Control On Line Data Transfers - F-1.3.1

The Control On Line Data Transfers function shall control the initiation of data file transmissions. It shall receive Transfer Data Blocks (B.178) from the Transfer Data (3.1.4.1.3) function. The Control On Line Data Transfers function shall insure that a connection can be established with the remote user by sending Connection Requests (B.15) to the Support Data Transfer Protocol (3.1.4.1.1.2) function. Any data in the Working Data Set (B.197) shall be able to be sent to the requester. The On Line Data Distribution Requests shall define the data to be transferred and allow its retrieval. This data shall be either a VAX data file or some subset of the DBMS database. The data shall be retrieved

and sent to the Support Data Transfer Protocol (3.1.4.1.1.2) function as actual blocks of data. These blocks of data shall be transferred across the link to the user using the appropriate data transfer protocol. (Refer to Data Flow Diagrams: DFD-1.3)

Inputs:	**From:**
None	
Outputs:	**To:**
Transfer Data Blocks	Support Data Transfer Protocol
Connection Requests	Support Data Transfer Protocol
Data Stores:	**Access:**
Working Data Set	reads

3.1.4.1.4 Process Mail - F-1.4

The Process Mail function shall permit the exchange of textual messages between processing functions and users at times when the users may not be connected to the system. This function shall permit the reception, storage, and transmission of mail messages. (Refer to Data Flow Diagrams: DFD-1)

Inputs:	**From:**
Incoming Mail	Support Communications
Mail Commands	Support Communications
Outputs:	**To:**
Outgoing Mail	Support Communications

3.1.4.1.4.1 Process Mail Command - F-1.4.1

The Process Mail Command function shall receive interactively entered commands pertaining to the electronic mail feature. These commands shall support the following functions:

1. Requests for a list of all mail waiting for a user.

2. Requests for the retrieval of one or more mail messages.

3. Requests for the deletion of messages that have been retrieved.

4. Commands allowing the entry of one or more Incoming-Mail messages.

5. Requests for a list of all mail users

(Refer to Data Flow Diagrams: DFD-1.4)

Inputs:	**From:**
Incoming Mail	Support Interactive Users
Mail Commands	Support Interactive Users
Outgoing Mail	Retrieve Mail
Outputs:	**To:**
Outgoing Mail	Support Interactive Users
Incoming Mail	Store Mail
Data Stores:	**Access:**
Pending Mail	reads
Pending Mail	writes

3.1.4.1.4.2 Retrieve Mail - F-1.4.2

The Retrieve Mail function shall retrieve one or more Outgoing-Mail messages requested by a user and shall transmit them back to the user via the Support-Communications function. (Refer to Data Flow Diagrams: DFD-1.4)

Inputs:	**From:**
None	
Outputs:	**To:**
Outgoing Mail	Process Mail Command
Data Stores:	**Access:**
Pending Mail	reads

3.1.4.1.4.3 Store Mail - F-1.4.3

The Store Mail function shall receive formatted text messages from various functions as well as Incoming Mail (B.85) from external users. These shall be stored in the Pending Mail (B.119) data store to await retrieval by the addressee. (Refer to Data Flow Diagrams: DFD-1.4)

Inputs:	**From:**
Incoming Mail	Process Mail Command
Outputs:	**To:**
None	
Data Stores:	**Access:**
Pending Mail	writes

3.1.4.2 Inspect Data - F-2

The Inspect Data function shall support the user in determining the existence, description, location and availability of information of interest for planetary science research including scientific data, ancillary data, spacecraft data, and planetary ephemerides. The function shall allow the user to query, retrieve, process, and display data interactively. The function shall allow the user to inspect catalog data, sample and summary data, and limited actual science data which is in machine-readable format under DBMS control within the central node. There shall be limited capabilities to inspect on line science data stored at discipline nodes.

The inspect capabilities that reside at each node for a data set not under DBMS control shall be determined by the respective discipline node responsible for providing that data set.

The inspect data function shall consist of the following functional areas: an inspect command interpreter, a data retrieval function, a data manipulation function, and a data display function. These functions are briefly described below.

The Interpret Inspect Commands (3.1.4.2.4) shall parse and decode the inspect commands from the interactive user, validate them, and route them to the appropriate function.

The Retrieve Inspect Data (3.1.4.2.1) function shall retrieve data which is on line, or request the staging of data which is not available for immediate inspection because it is currently off line.

The Manipulate Inspect Data (3.1.4.2.3) function shall provide a predefined suite of functions which allow the user to perform minor processing operations on retrieved data to allow the user to better evaluate its utility for a particular research study.

The Display Data (3.1.4.2.2) function shall provide a predefined suite of functions for displaying retrieved data in textual, graphic, or image form. In addition, all data responses from the inspect data function to the user shall pass through this function. (Refer to Data Flow Diagrams: DFD-0)

Inputs:	**From:**
Inspect Data Commands	Access System
Outputs:	**To:**
Inspect Data Responses	Access System
Data for Display	Access System
Request to Stage Data	Prepare Data
Data Stores:	**Access:**
Operational Planetary Data	reads

3.1.4.2.1 Retrieve Inspect Data - F-2.1

The Retrieve Inspect Data function shall retrieve data which is on line or request the staging of data which is not available for immediate inspection because it is currently off line. The function shall perform a limited set of relational database operations including project, join, and select on data controlled by the DBMS at the central node. This function shall be able to retrieve data which is not under control of the DBMS (e.g., VAX data files) and transfer it to the Working Data Set where it can be inspected and manipulated. Refer to Working Data Set (B.197) for a description of the role of the Working Data Set. The capability to retrieve non-DBMS controlled data shall be limited to the retrieve capabilities which the discipline nodes provide for their critical data sets. (Refer to Data Flow Diagrams: DFD-2)

Inputs:	**From:**
Retrieve Data Commands	Interpret Inspect Commands
Outputs:	**To:**
User Notification	Interpret Inspect Commands
Request to Stage Data	Store Data
Data Stores:	**Access:**
DBMS Reference Data	reads
Working Data Set	writes
DBMS Reference Data	writes

3.1.4.2.1.1 Interpret Retrieve Command - F-2.1.1

The Interpret Retrieve Command function shall interpret a retrieve request and classify it as one of three categories. The categories shall be as follows:

1. Retrieve DBMS controlled data using relational operators

2. Retrieve on line non-DBMS data

3. Issue requests to stage data which is not currently on line

This function shall access the data dictionary and the stock record inventory to determine which type of retrieve request has been requested. DBMS commands shall be formulated for category one requests and those commands shall be sent to the Retrieve DBMS Data (3.1.4.2.1.2) function.

A request for non-DBMS data shall be formulated for category two requests if the data resides at the central node. The non-DBMS retrieve data request shall then be sent to Retrieve Non DBMS Data (3.1.4.2.1.3) function. If the data resides at the discipline nodes, the function shall provide information to the user from the Catalog (B.6) and stock record inventory about where the data is located and any available information about how to access the data at the designated discipline node. The user shall then be allowed to select a menu option in the Access System (3.1.4.1) function, which shall route the user to the specified node via SPAN. The user will then be beyond the limits of the supported PDS Version 1.0.

If the data is determined to be currently off line and is also one of th authorized PDS Version 1.0 data sets that can be brought on line under DBMS control, then a request to stage data shall be formulated and sent to the Service Data Staging Requests (3.1.4.6.5.8). The user shall then be notified that the data is being brought on line. The Service Data Staging Requests (3.1.4.6.5.8) function shall not be an automatic interactive function, but shall be performed in batch mode. Several hours to several days may be required for this, depending on what has already been scheduled in the PDS. (See Service Data Staging Requests (3.1.4.6.5.8) for further information.) The user shall be notified via the Process Mail (3.1.4.1.4) function when the Service Data Storage Requests (3.1.4.6.5.7) function has brought the user requested data on line under DBMS control. Once the user has been notified that the data he requested has been brought on line, the user can then reenter the Inspect Data (3.1.4.2) function and retrieve, manipulate and display the data.

PROCEDURE:

Check type of requested data using data dictionary, and stock record inventory.

Categorize retrieve request based upon type of requested data.

For Category 1, formulate DBMS commands and send to Retrieve DBMS Data (3.1.4.2.1.2).

For Category 2, if data is at central node, formulate request for Non-DBMS Data and send to Retrieve Non DBMS Data (3.1.4.2.1.3). If data is at discipline node, notify user via a User Notification (B.190) and provide

available information on location of data and on node access software, if available.

For Category 3, formulate Request to Stage Data (B.133) and send to Service Data Staging Requests (3.1.4.6.5.8). Notify user via a User Notification (B.190) message that data must be brought on line.
(Refer to Data Flow Diagrams: DFD-2.1)

Inputs:	**From:**
Retrieve Data Commands	Route Parsed Commands
DBMS Error Message	Retrieve DBMS Data
Outputs:	**To:**
DBMS Commands	Retrieve DBMS Data
Request for Non DBMS Data	Retrieve Non DBMS Data
User Notification	Parse Command/Prepare Response
Request to Stage Data	Service Data Staging Requests
Data Stores:	**Access:**
Catalog	reads

3.1.4.2.1.2 Retrieve DBMS Data - F-2.1.4

The Retrieve DBMS Data function shall retrieve DBMS controlled data using relational operators and shall logically place the retrieved data into the Working Data Set (B.197) for further processing.

This function shall accept and validate the DBMS Commands (B.23). It shall then store the validated selection parameters (field values) from the DBMS Command into the User Selection Parameters (B.192). This function shall maintain this set of user default values for key fields (parameters) to be used in ordering data or making additional retrieval requests. This function shall then perform the necessary retrieval operations to find and access the requested data.

This function shall be able to retrieve any DBMS controlled data using the following relational operators: SELECT, PROJECT and JOIN. For the sake of completeness, the definitions for these relational operators are included in this description.

The SELECT operator retrieves information from the database by selecting all rows of an existing table (relation) that satisfy some specified condition. This condition clause shall be expressed as a Boolean combination of terms. The Boolean operators shall be AND, OR and NOT. Each term can be composed of a selected field or expression, a comparison operator, and a value. The selected field or column must be from the referenced relation. The expression can be composed of fields from the relation, constants and algebraic operators (i.e., +, -, x, /). The comparison operators can be =, >=, (not equal), >,>=, < and <=. Parentheses can also be used in the condition clause to indicate desired order of evaluation.

The PROJECT operator retrieves information by extracting specified columns from

an existing table in the database and removing any redundant duplicate rows in the set of columns extracted. Significance shall be assigned to the order of attributes within the relation in the database. Therefore, projection shall allow the user to retrieve the attributes of a given relation in the order that the user wants to see the attributes (data items).

The JOIN operator is used to retrieve information from two or more tables simultaneously. If two tables have a column defined over the same common domain, then these tables can be joined using these two columns. The results of the join produces a view to the user of a new wider table in which each row is formed by concatenating two rows, one from each of the original tables. The following types of joins will be supported: natural JOINS, fuzzy JOINS, and outer JOINS.

The JOIN is performed between two or more relations according to a specified "joining condition" clause. This "joining condition" clause is similar to the "condition" clause described for the SELECT operator. It describes the field(s) in common between the relations to be joined and identifies the type of JOIN by using a comparison operator (=, >=, >, etc.).

An equi-join is a JOIN in which the "joining condition" is based on equality (=) between values in the common column(s). For an equi-join example, the "joining condition" would be "field A from Table 1 = field B from Table 2". An equi-join with one of the two identical columns eliminated is called a natural JOIN. The natural JOIN will most likely be the most commonly used JOIN operation performed in an inspect data request.

The fuzzy JOINs shall be supported in a limited capacity. The fuzzy JOIN is one in which the "joining condition" is based upon a non-equality (i.e >, <, >=, <=). A good example of when a fuzzy JOIN could be useful is in comparing data from instrument X with instrument Y where the data were collected at different time intervals. the "joining condition" clause of a fuzzy JOIN in this case might look like this: time from instrument X >= time from instrument Y + or - 5 seconds. Fuzzy JOINs can produce misleading or questionable results if the "joining condition" clause is not properly defined. Thus, this fuzzy JOIN operation should only be used where absolutely necessary and possibly with questionable results.

An outer-join is a JOIN of two or more tables in a database in which the joining field(s) between tables do not always occur in each table. When a traditional relational join is performed, data can be retrieved from each of two tables only if the joining field(s) contain matching values in each of the tables. If one table contains a value that does not occur in the other table, the data from the first table is not retrieved.

There are cases, however, when it is useful to retrieve data from a primary table even if no match is found in the secondary table. For example, there is a table D describing detailed information about data collected by instruments and a table P describing various products produced from the data collected. If a natural JOIN was performed between the two tables, the only data that would be retrieved would be data in table D that also had a match in table P. Since not all science data collected is processed into high level products, some of the science data that had been collected would not be shown in the results of this JOIN. If on the other hand, an OUTER-JOIN is performed between the two tables with table D being the primary table, then all science data collected would appear in the results of the JOIN regardless of whether any high level products had been produced.

This function shall perform an ORDER operation which orders the data by user

designated field(s) as it is retrieved from the database.

The Retrieve DBMS Data function shall also provide an EXPORT operation which shall logically move the retrieved data from the DBMS Reference Data (B.26) database into the Working Data Set (B.197). This function shall provide the capability to logically reference a subset of data in the database based upon a data retrieval request (DBMS-Command) and to further manipulate this subset of data. This function shall also provide the capability to physically store the results of a data retrieval request in a temporary table so that other data manipulation operations could be performed on this data. Whether this EXPORT operation physically replicates data or just references it as different logical data shall be determined during the implementation phase. If the data is physically stored in a temporary table, then this table shall be deleted when the user ends a log-on session. (Refer to Data Flow Diagrams: DFD-2.1)

Inputs:	**From:**
DBMS Commands	Interpret Retrieve Command
Outputs:	**To:**
DBMS Error Message	Interpret Retrieve Command
Data Stores:	**Access:**
DBMS Reference Data	reads
Working Data Set	writes
User Selection Parameters	writes

3.1.4.2.1.3 Retrieve Non DBMS Data - F-2.1.7

The Retrieve Non DBMS Data function shall retrieve data which is not under DBMS control and shall logically relocate the data to the Working Data Set (B.197) for further processing. For PDS Version 1.0, the data retrieved by this function shall reside at the central node (JPL). This function shall accept a Request for Non DBMS Data (B.132), validate the request using the stock-record-inventory, retrieve the data and place the data in the Working Data Set (B.197). The function shall also store the validated selection parameters (field values) from the Request for Non DBMS Data (B.132) into the User Selection Parameters (B.192). This capability shall maintain a set of user default values for key fields (parameters) to be used in ordering data or making additional retrieval requests. If the data cannot be retrieved or relocated to the Working Data Set (B.197), then an error message shall be sent to the user.

This function shall be limited to whatever retrieve capabilities the discipline nodes provide to the central node for their critical data sets. It shall also be limited by what data sets are actually stored on line at the central node.

As mentioned in Interpret Retrieve Command (3.1.4.2.1.1), critical data sets that reside at the discipline notes in on line non-DBMS storage can be accessed using existing discipline node software, if it is available. However, this shall not be part of the supported PDS Version 1.0 and the user shall have to transfer via SPAN to the discipline node to find out detailed information about this data and about how to access this data and the existing node software. (Refer to Data Flow Diagrams: DFD-2.1)

Inputs:	**From:**
Request for Non DBMS Data	Interpret Retrieve Command
Outputs:	**To:**
None	
Data Stores:	**Access:**
Working Data Set	writes
User Selection Parameters	writes
On Line Non DBMS Data	writes

3.1.4.2.2 Display Data - F-2.3

The Display Data function shall provide the capability to display data in text, graphic and image form as appropriate and as requested. Any data held in the Working Data Set (B.197) shall be able to be displayed. The function shall determine the best way to display the requested data or the user may select and specify the way in which the data are to be shown. Graphic and image displays require that the user have a supported graphic or image display device and be connected by an appropriate communications link. (User requests that would result in large amounts of graphic and image data to be transferred over low-speed links will be discouraged or even denied. For example, it would take nearly 45 minutes to transfer a 512x512 image of 8-bit pixels over a 1200-baud dial-up line). (Refer to Data Flow Diagrams: DFD-2)

Inputs:	**From:**
Display Commands	Interpret Inspect Commands
Outputs:	**To:**
Data for Display	Interpret Inspect Commands
Data Stores:	**Access:**
Working Data Set	reads

3.1.4.2.2.1 Interpret Display Command - F-2.3.1

The Interpret Display Command function shall accept parsed display commands from the Interpret Inspect Commands (3.1.4.2.4) function, determine if the request is compatible with the user's display device and communications link, convert the display command into a format that can be executed by the appropriate display function, activate that display function and route the executable display command to it. (Refer to Data Flow Diagrams: DFD-2.3)

Inputs:	**From:**
Display Commands	Route Parsed Commands
Outputs:	**To:**
Display Text Commands	Display Text
Ordered Data	Display Text
Display Graph Commands	Display Graph
Ordered Data	Display Graph
Display Image Commands	Display Image
Ordered Data	Display Image
Data Stores:	**Access:**
Working Data Set	reads
User Profile	reads

3.1.4.2.2.2 Display Text - F-2.3.2

The Display Text function shall accept executable display commands for output of text data, retrieve the specified data from the Working Data Set (B.197), format the data into ASCII text and route the output to the user's display device. Text output shall be displayed in either report or column listing format. Reports shall consist of a set of parameter names and values arranged in pairs similar to the following: parameter = value. There may be one or more parameter/value pairs per line. Column listings shall consist of a line with a set of parameter names followed by one or more lines with the values for those parameters arranged to form columns. The number of parameters which can be included in a column listing shall be limited by the maximum width of a line of text on the user's display device.

Values shall be formatted in a manner appropriate for their underlying data type. Values with fractional components shall be displayed in a decimal (dd.dd) or exponential (dd.ddEnn) format, as appropriate. (Refer to Data Flow Diagrams: DFD-2.3)

Inputs:	**From:**
Display Text Commands	Interpret Display Command
Ordered Data	Interpret Display Command
Outputs:	**To:**
Text for Display	Parse Command/Prepare Response

3.1.4.2.2.3 Display Graph - F-2.3.3

The Display Graph function shall accept executable display commands for graphic output of data, retrieve the specified data from the Working Data Set (B.197), format the data into a graph or chart and route the output to the user's display device.

This function shall provide X-Y plots and bar charts for display of two-dimensional data. Bar charts will be useful for displaying histograms. Two-dimensional X-Y graphs will be appropriate when there is a series of values for one parameter (for example, a parameter sampled on some regular time interval) or when two one-dimensional arrays are to be plotted versus each other (example: a spectrum where an array containing intensities can be plotted against an array containing the corresponding wavelengths). This function shall provide for linear and log scaling of the data independently in the X and Y dimensions: linear-linear, linear-log, log-linear and log-log plots will be available.

Pseudo-three-dimensional displays in the form of contour plots and 3-D surface plots shall also be available. Pseudo-three-dimensional graphs are useful when a parameter is a function of two independent variables (for example, a measurement made over a range of latitudes and longitudes). Data for pseudo-three-dimension plots is usually supplied as a two-dimension array (which assumes that the values of the two independent variables are spaced at uniform intervals) or as three one-dimensional arrays.

This function shall be capable of automatically setting the format of graphic output, including the drawing, scaling and labeling of axes. If desired the user shall be able to override the defaults and control the formatting of graphic output, including minimum and maximum axes values, line type and color, label size, and format, etc. Not all display options will be available on all display devices. The definition of supported graphic terminals shall be performed in the system design phase.

The availability of the functions described in this section shall be strictly dependent upon the development activities of personnel at the UCLA discipline node. This function shall be provided for selected data sets and shall utilize the capabilities of either XIDL or a graphics software package like TEMPLATE. (Refer to Data Flow Diagrams: DFD-2.3)

Inputs:	**From:**
Display Graph Commands	Interpret Display Command
Ordered Data	Interpret Display Command
Outputs:	**To:**
Graph for Display	Parse Command/Prepare Response

3.1.4.2.2.4 Display Image - F-2.3.4

The Display Image function shall accept display image commands, retrieve the specified data from the Working Data Set, and shall display the image data on the user's terminal.

This function shall be limited to the image display routines provided by the discipline nodes. The amounts of capability provided to display images and which data sets can be displayed shall be determined during the system design phase. (Refer to Data Flow Diagrams: DFD-2.3)

Inputs:	**From:**
Display Image Commands	Interpret Display Command
Ordered Data	Interpret Display Command
Outputs:	**To:**
Image for Display	Parse Command/Prepare Response

3.1.4.2.3 Manipulate Inspect Data - F-2.5

The Manipulate Inspect Data function shall provide a set of basic processing operations that can be applied to data retrieved from the Working Data Set (B.197) to make it easier for a user to assess the data. The user may use this function, for example, to average a set of values to reduce the amount of information that would be output by the Display Data (3.1.4.2.2) function.

This function shall accept data manipulation commands from Interpret Inspect Commands (3.1.4.2.4) and parse each command to determine what action is to be taken. Not all data manipulation functions can be applied to all types of data, but if a data manipulation request is legitimate the data to be manipulated will be retrieved from the Working Data Set (B.197), the manipulation performed and the results placed into the Working Data Set (B.197).

The data manipulation that can be performed is dependent upon the type of data. These dependencies are outlined in the paragraphs below.

Unmanipulatable Data: Much of the data in the database will not be appropriate for any data manipulation. This includes text strings and non-mathematical numeric values used for parameters like filter number, telemetry data rate, data processing level and data quality. Attempts to manipulate such data shall result in an error message.

One-dimensional Data: Certain operations shall be available for a single-dimensional series of values. One-dimensional data includes time series data, where many measurements of a parameter are taken at a specific time interval, and also data such as spectra where an intensity is recorded at a series of energy levels or wavelengths.

Two-dimensional data, including images: The data manipulation functions available

for this class of data shall be determined in the design phase.

The types of manipulation operations which shall be available are described below:

1. Statistical Functions (3.1.4.2.3.2)

2. Sample Data (3.1.4.2.3.3)

3. Convert Data (3.1.4.2.3.4)

4. Image Processing (3.1.4.2.3.5)

(Refer to Data Flow Diagrams: DFD-2)

Inputs:	**From:**
Manipulation Data Command	Interpret Inspect Commands
Outputs:	**To:**
None	
Data Stores:	**Access:**
Working Data Set	reads
Working Data Set	writes

3.1.4.2.3.1 Interpret Manipulate Command - F-2.5.1

The Interpret Manipulate Command function shall accept parsed data manipulation commands from the Interpret Inspect Commands (3.1.4.2.4) function, ensure that the request is compatible with the data the user wants to manipulate, convert the manipulation command into a form in which it can be executed and route the executable manipulation command to the appropriate manipulate data function for action. Any error in the input command shall cause an error message to be returned to the user. (Refer to Data Flow Diagrams: DFD-2.5)

Inputs:	**From:**
Manipulation Command Error Message	Statistical Functions
Manipulation Command Error Message	Sample Data
Manipulation Command Error Message	Convert Data
Manipulation Command Error Message	Image Processing
Outputs:	**To:**
Statistics Command	Statistical Functions
Sample Command	Sample Data
Convert Command	Convert Data
Image Processing Command	Image Processing
Manipulation Command Error Message	Parse Command/Prepare Response
Manipulation Command Error Message	Route Parsed Commands

Data Stores:	Access:
User Selection Parameters	reads

3.1.4.2.3.2 Statistical Functions - F-2.5.2

The Statistical Functions function shall receive executable manipulation directives from the Interpret Manipulate Command (3.1.4.2.3.1) function, retrieve necessary data from the Working Data Set (B.197), perform the specified manipulation on the data and then place the result into the Working Data Set.

For DBMS controlled data, the function shall utilize the DBMS software to provide the following statistical functions for one-dimensional data: total, averages, and minimum and maximum values. The discipline nodes shall be responsible for providing routines to do standard deviation and linear least squares fit utilizing XIDL or FORTRAN.

For non-DBMS controlled data, the capabilities of this function shall be provided by discipline node software utilizing either XIDL or FORTRAN. (Refer to Data Flow Diagrams: DFD-2.5)

Inputs:	From:
Statistics Command	Interpret Manipulate Command
Outputs:	**To:**
Manipulation Command Error Message	Interpret Manipulate Command
Data Stores:	**Access:**
Working Data Set	reads
Working Data Set	writes

3.1.4.2.3.3 Sample Data - F-2.5.3

The Sample Data function shall accept executable data sampling directives from the Interpret Manipulate Command (3.1.4.2.3.1) function, retrieve necessary data from the Working Data Set (B.197), perform the specified manipulation on the data and then place the result into the Working Data Set.

The Sample Data function shall perform basic data sampling operations on retrieved science data. The data manipulation functions available for one-dimensional data shall include choosing n values, where n is specified by the user. The user may also specify whether the selected values are to be spaced at a regular interval (for example: every 3rd measurement) or selected through random sampling. (Refer to Data Flow Diagrams: DFD-2.5)

Inputs:	From:
Sample Command	Interpret Manipulate Command
Outputs:	**To:**
Manipulation Command Error Message	Interpret Manipulate Command
Data Stores:	**Access:**
Working Data Set	reads
Working Data Set	writes

3.1.4.2.3.4 Convert Data - F-2.5.4

The Convert Data function shall accept executable data conversion directives from the Interpret Manipulate Command (3.1.4.2.3.1) function, retrieve necessary data from the Working Data Set (B.197), perform the specified manipulation on the data and then place the result into the Working Data Set (B.197).

The Convert Data function shall perform basic data type conversion operations on retrieved science data. There shall be functions to convert 3-D cartesian vectors to appropriate spherical coordinates and back from spherical to cartesian. Simple vector manipulation routines such as dot product, cross product and normalization shall also be available. Routines for converting cartesian coordinate vectors from one common epoch of measurement to another (from 1950.0 to 2000.0 for example) shall also be available. These capabilities shall be provided by the discipline nodes.

There shall be functions to convert integers to real numbers, real numbers to integers, single precision reals to double precision, and double precision reals to single precision. For DBMS controlled data, the function shall provide these capabilities by utilizing the DBMS software. For non-DBMS controlled data, these capabilities shall be provided by discipline node developed software utilizing either XIDL or FORTRAN.

The shall be functions to perform mathematical operations on all values in a series, including at least addition and subtraction of a constant value (useful for such things as subtracting a background level from a spectrum), multiplication and division by a constant (useful for scaling), natural and base-10 logarithm, absolute value, sine, cosine, arc-sine and arc-cosine. These capabilities shall be provided by discipline node developed software utilizing either XIDL or FORTRAN. (Refer to Data Flow Diagrams: DFD-2.5)

Inputs:	From:
Convert Command	Interpret Manipulate Command

Outputs:	To:
Manipulation Command Error Message	Interpret Manipulate Command

Data Stores:	Access:
Working Data Set	reads
Working Data Set	writes

3.1.4.2.3.5 Image Processing - F-2.5.5

The Image Processing function shall accept executable image processing directives from the Interpret Manipulate Command (3.1.4.2.3.1) function, retrieve necessary data from the Working Data Set (B.197), perform the specified manipulation on the data and then place the result into the Working Data Set.

The Image Processing function shall perform elementary image processing functions established in the system design phase.

The amount of capability provided by this function shall be dependent upon the discipline node developed software supplied for PDS implementation Version 1.0. (Refer to Data Flow Diagrams: DFD-2.5)

Inputs:	From:
Image Processing Command	Interpret Manipulate Command

Outputs:	To:
Manipulation Command Error Message	Interpret Manipulate Command

Data Stores:	Access:
Working Data Set	reads
Working Data Set	writes

3.1.4.2.4 Interpret Inspect Commands - F-2.7

The Interpret Inspect Commands function shall analyze the inspect commands from the interactive user, validate the command, and route it to the appropriate inspect data function. If the command contains an error in syntax or content, the user shall be notified with an error message response. (Refer to Data Flow Diagrams: DFD-2)

Inputs:	From:
Inspect Data Commands	High Level User Interface
Data for Display	Display Data
User Notification	Retrieve Inspect Data

Outputs:	To:
Inspect Data Responses	High Level User Interface
Data for Display	High Level User Interface
Retrieve Data Commands	Retrieve Inspect Data
Display Commands	Display Data
Manipulation Data Command	Manipulate Inspect Data

3.1.4.2.4.1 Parse Command/Prepare Response - F-2.7.1

The Parse Command/Prepare Response function shall receive inspect commands and route response data from the inspect functions to the interactive user. Commands shall be parsed, decomposed, and validated. (Refer to Data Flow Diagrams: DFD-2.7)

Inputs:	From:
Inspect Data Commands	Communicate with Process
Image for Display	Display Image
Graph for Display	Display Graph
Text for Display	Display Text
User Notification	Interpret Retrieve Command
Manipulation Command Error Message	Interpret Manipulate Command

Outputs:	To:
Inspect Data Responses	Communicate with Process
Data for Display	Communicate with Process
Parsed Commands	Route Parsed Commands

3.1.4.2.4.2 Route Parsed Commands - F-2.7.2

The Route Parsed Commands function shall accept a parsed, complete, and valid command with associated parameters and route the command to the inspect data sub-functions. This function shall be able to route the following types of commands: retrieve data, display data, manipulate data, and formulate data order. (Refer to Data Flow Diagrams: DFD-2.7)

Inputs:	From:
Parsed Commands	Parse Command/Prepare Response
Manipulation Command Error Message	Interpret Manipulate Command

Outputs:	**To:**
Retrieve Data Commands	Interpret Retrieve Command
Display Commands	Interpret Display Command

3.1.4.3 Order Data - F-3

The Order Data function shall provide all services required to accept an order from a user, insure its validity, confirm the reasonability of the order from the viewpoint of the user, verify that all required information has been provided, and prepare the order for its actual execution by the Distribute Data (3.1.4.4) function. The Order Data function shall operate interactively with the user and any errors entered by the user shall be reported in real time.

After inspecting the PDS catalog or actual science data, the user may decide to order some data. The Order Data function shall be invoked by the entry of a command or by selecting a menu option. The complete order shall consist of the following four parts not all of which are user specified:

1. User Information
2. Data Logical Name
3. Data Qualifiers
4. Processing Instructions

This information shall be extracted from the User Profile (B.191) and the User Selection Parameters (B.192) and sent to the Distribute Data (3.1.4.4) function. All information shall be verified, and if any error or unusual conditions are found, the user shall be notified via an error message sent to the terminal. This function shall provide the user the opportunity to review and correct the information in the order. (Refer to Data Flow Diagrams: DFD-0)

Inputs:	**From:**
Order Data Commands	Access System
Outputs:	**To:**
Order Data Responses	Access System
Accepted Data Order	Distribute Data

Data Stores:	Access:
Operational Planetary Data	reads

3.1.4.3.1 Verify User Information Complete - F-3.1

The Verify User Information Complete function shall accept the User Information (B.186) and shall determine if the user information for this order is complete and valid. If additional information is required, the user shall be queried for the missing information. The response shall be accepted and verified and stored in the user profile for the next data order. All Verified User Information (B.196) shall be sent on to the Extract Data Definition (3.1.4.3.7) function for the next step in the ordering process. (Refer to Data Flow Diagrams: DFD-3)

Inputs:	From:
Additional User Information	Interpret Order Commands
User Information	Extract User Information
Outputs:	**To:**
Requests for more User Information	Interpret Order Commands
Verified User Information	Extract Data Definition
Orders for On Line Data Distribution	Interpret Order Retrieve Command

3.1.4.3.2 Accept Order - F-3.2

The Accept Order function shall accept Verified Data Order (B.195). A unique order number/identification shall be assigned to each accepted order. Also for each order accepted, the Accept Order function shall add an entry to the Pending Orders (B.120) reflecting this accepted order that has not yet been filled. (Refer to Data Flow Diagrams: DFD-3)

Inputs:	From:
Verified Data Order	Verify Data Definition Correct
Outputs:	**To:**
Accepted Data Order	Select On Line Orders
Data Stores:	**Access:**
Pending Orders	writes

3.1.4.3.3 Select On Line Orders - F-3.3

The Select On Line Orders function shall determine which accepted data orders can be filled in real time by electronic data transfers over communication links. For an order to be filled in real time the following criteria must be met: 1) the user must have requested on line distribution, 2) the data must be totally on line, and 3) the user must have the facilities to accept on line data transfers. Orders which satisfy these criteria shall be sent to the Distribute Data (3.1.4.4) function for automated execution. All other data orders shall be manually processed in Version 1.0. (Refer to Data Flow Diagrams: DFD-3)

Inputs:	**From:**
Accepted Data Order	Accept Order
Outputs:	**To:**
Orders for Deferred Distribution	Prepare Order Form
Orders for On Line Data Distribution	Retrieve Ordered Data
Orders for On Line Data Distribution	Interpret Order Retrieve Command

3.1.4.3.4 Prepare Order Form - F-3.4

The Prepare Order Form function shall receive all orders which cannot be electronically distributed. The information shall be formatted into a Data Order Form (B.34) for transmittal to the data node for execution. Data Order Form (B.34) shall be transmitted by the Process Mail (3.1.4.1.4) function to the data node. The Data Order Form (B.34) received over an interval shall be stored and printed out locally upon operator command. The operator shall be able to query the system to determine how many orders have been received and are awaiting printout. (Refer to Data Flow Diagrams: DFD-3)

Inputs:	**From:**
Orders for Deferred Distribution	Select On Line Orders
Outputs:	**To:**
Data Order Form	Process Order Manually

3.1.4.3.5 Extract User Information - F-3.5

The Extract User Information function is the first step in the Order Data (3.1.4.3) process. It shall be initiated by the entry of a Commence Order Command (B.13). The Extract User Information function shall extract User Information (B.186) from the User Profile (B.191). This information shall be passed onto the next step in the process for verification. If all the information is not already in the User Profile (B.191), the deficiency shall be noted. This required information shall include the user's name, address, account number, preferred distribution method or media, and other user-oriented information. (Refer to Data Flow Diagrams: DFD-3)

Inputs:	**From:**
Commence Order Command	Interpret Order Commands
Outputs:	**To:**
User Information	Verify User Information Complete
Data Stores:	**Access:**
User Profile	reads

3.1.4.3.6 Interpret Order Commands - F-3.6

The Interpret Order Commands function shall interpret all Order Data Commands (B.109) entered by the user during the Order Data (3.1.4.3) process. It shall pass the commands entered by the user to the function capable of handling that command. It shall also format all Order Data Responses (B.110) from the system, error messages, and requests for data for display on the user's terminal. (Refer to Data Flow Diagrams: DFD-3)

Inputs:	**From:**
Order Data Commands	High Level User Interface
Requests for more User Information	Verify User Information Complete
Prepared Order	Verify Data Definition Correct
Order Data Commands	Communicate with Process
Outputs:	**To:**
Order Data Responses	High Level User Interface
Additional User Information	Verify User Information Complete
Commence Order Command	Extract User Information
Order Verification/Correction	Verify Data Definition Correct

3.1.4.3.7 Extract Data Definition - F-3.7

The Extract Data Definition function shall reference the User Selection Parameters (B.192) to determine what data is to be retrieved. The User Selection Parameters (B.192) shall contain three types of information:

Data Logical Name

Data Qualifiers

Processing Instructions

The output of the Extract Data Definition function shall be a complete order containing both User Information (B.186) and the User Selection Parameters (B.192) described above. (Refer to Data Flow Diagrams: DFD-3)

Inputs:	**From:**
Verified User Information	Verify User Information Complete
Outputs:	**To:**
User Information and Data Definition	Verify Data Definition Correct
Data Stores:	**Access:**
User Selection Parameters	reads

3.1.4.3.8 Verify Data Definition Correct - F-3.8

The Verify Data Definition Correct function shall verify that the Pending Orders (B.120) information is valid by comparing it with information in the Operational Planetary Data (B.107). If inconsistencies are found, the user shall be prompted for a correction. If the order is valid the Prepared Order (B.124) shall be presented to the user for review and verification. If the user approves of the order, he shall respond with a Order Verification/Correction (B.111). If there are problems, he shall respond with an Order Verification/Correction (B.111).

If approved, the Verified Data Order (B.195) shall be sent to the Accept Order (3.1.4.3.2) function for final processing. (Refer to Data Flow Diagrams: DFD-3)

Inputs:	**From:**
Order Verification/Correction	Interpret Order Commands
User Information and Data Definition	Extract Data Definition

Outputs:	To:
Verified Data Order	Accept Order
Prepared Order	Interpret Order Commands
Data Stores:	**Access:**
Operational Planetary Data	reads

3.1.4.4 Distribute Data - F-5

The Distribute Data function shall be responsible for acquiring data ordered by users, optionally processing the data in specified ways and then transferring the data to the user. The Distribute Data function shall receive an accepted order from the Order Data (3.1.4.3) function.

In PDS Version 1.0 only one type of order shall be automated: orders for on line or electronic distribution. All other orders shall be executed by manual procedures.

The Distribute Data function shall receive accepted orders in two ways. Orders for On Line Data Distribution (B.116) shall be received as an automated data flow. All other orders shall be received as an Accepted Data Order (B.1).

Orders for On Line Data Distribution (B.116) shall cause the requested data to be transmitted across the selected electronic pathway.

An Accepted Data Order (B.1) will be filled by procedures which are no part of the automated PDS. The requested data shall be retrieved, prepared and distributed by manual or automated procedures as appropriate.

In either case, a mechanism for controlling orders shall be implemented. Every new order shall be entered into the Pending Orders (B.120). Operations personnel shall be able to query the pending order file to determine the number and content of each unfilled order. As each order is filled (either by automated or manual means), the order shall be removed from the pending order file. (Refer to Data Flow Diagrams: DFD-0)

Inputs:	From:
Accepted Data Order	Order Data
Outputs:	**To:**
On Line Data Distribution Requests	Access System
Request to Stage Data	Prepare Data
Data for Physical Distribution	PDS Users

Data Stores:	Access:
Operational Planetary Data	reads

3.1.4.4.1 Send Order Confirmation Mail - F-5.2

The Send Order Confirmation Mail function shall place an Order Confirmation to User (B.108) on the Pending Mail (B.119) file for later access by the user. This function shall notify a user when his order has been executed. The user shall have the capability to access his mail at any time to receive these execution confirmations. The confirmation shall fully identify the order including order number, date of order, date of execution, identity of data requested, and method of distribution. (Refer to Data Flow Diagrams: DFD-5)

Inputs:	From:
Order Confirmation to User	Remove Pending Order
Outputs:	**To:**
None	
Data Stores:	**Access:**
Pending Mail	writes

3.1.4.4.2 Process Order Manually - F-5.3

The Process Order Manually function shall be a manually controlled procedure in Version 1.0. This function shall be performed at the prototype discipline/data nodes using existing procedures which may be a combination of manual and automated steps. This function shall receive a Data Order Form (B.34) for Non-DBMS controlled data. It shall retrieve the requested data, process the data as required, prepare the distribution media, and ship the data. When the order has been completed and shipped, a Notice of Processed Order (B.102) shall be returned to the central node. (Refer to Data Flow Diagrams: DFD-5)

Inputs:	From:
Data Order Form	Prepare Order Form
Outputs:	**To:**
Notice of Processed Order	Remove Pending Order
Data for Physical Distribution	PDS Users

Data Stores:	Access:
Operational Planetary Data	reads

3.1.4.4.3 Retrieve Ordered Data - F-5.4

The Retrieve Ordered Data function shall retrieve data which is on line or request the staging of data which is not available for immediate inspection because it is currently off line. The function shall perform a limited set of relational database operations including project, join, and select on data controlled by the DBMS at the central node and possibly at two discipline nodes - planetary atmospheres at LASP, and fields and particles at UCLA. This function, in a non-integrated way, shall be able to retrieve data which is not under control of the DBMS (e.g. VAX data files) and transfer it to the Working Data Set (B.197). The capability to retrieve non-DBMS controlled data shall be strictly limite to the retrieve capabilities the discipline nodes provide for their critical data sets. (Refer to Data Flow Diagrams: DFD-5)

Inputs:	From:
Orders for On Line Data Distribution	Select On Line Orders

Outputs:	To:
Retrieve Data Notification	Distribute Data Online
Request to Stage Data	Store Data

Data Stores:	Access:
Operational Planetary Data	reads
Operational Planetary Data	writes
Working Data Set	writes

3.1.4.4.3.1 Retrieve Ordered DBMS Data - F-5.4.3

The Retrieve Ordered DBMS Data function shall retrieve DBMS controlled data which has been ordered and shall place it in the Working Data Set (B.197). The Retrieve Ordered DBMS Data function shall retrieve DBMS controlled data in the manner described under Retrieve DBMS Data (3.1.4.2.1.2). (Refer to Data Flow Diagrams: DFD-5.4)

Inputs:	From:
None	

Outputs:	**To:**
DBMS Error Message	Interpret Order Retrieve Command
Data Stores:	**Access:**
DBMS Reference Data	reads
Working Data Set	writes

3.1.4.4.3.2 Interpret Order Retrieve Command - F-5.4.5

The Interpret Order Retrieve Command function shall receive the original Orders for On Line Data Distribution (B.116) from the Order Data (3.1.4.3) function. It shall analyze the definition of the requested data and classify it into one of three categories. The categories are: 1) requests to retrieve DBMS controlled data using relational operators, 2) requests to retrieve on line non-DBMS data, 3) requests to stage data which is not currently on line. The order shall be passed on to the appropriate function to process that category of request. (Refer to Data Flow Diagrams: DFD-5.4)

Inputs:	**From:**
Orders for On Line Data Distribution	Verify User Information Complete
DBMS Error Message	Retrieve Ordered DBMS Data
Orders for On Line Data Distribution	Select On Line Orders
Outputs:	**To:**
DBMS Commands	Interpret Order Retrieve Command
Request for Non DBMS Data	Retrieve Ordered Non DBMS Data
Retrieve Data Notification	Distribute Data Online
Request to Stage Data	Service Data Staging Requests
Data Stores:	**Access:**
Catalog	reads

3.1.4.4.3.3 Retrieve Ordered Non DBMS Data - F-5.4.7

The Retrieve Ordered Non DBMS Data function shall retrieve non-DBMS controlled data which has been ordered and shall place it in the Working Data Set (B.197). The Retrieve Ordered Non DBMS Data function shall retrieve non-DBMS controlled data in the manner described under Retrieve Non DBMS Data (3.1.4.2.1.3). (Refer to Data Flow Diagrams: DFD-5.4)

Inputs:	From:
Request for Non DBMS Data	Interpret Order Retrieve Command
Outputs:	**To:**
None	
Data Stores:	**Access:**
Operational Local Archive	reads
Working Data Set	writes

3.1.4.4.4 Remove Pending Order - F-5.5

The Remove Pending Order function shall accept a Notice of Processed Order (B.102). It shall remove the entry referencing that order from the Pending Orders (B.120). (Refer to Data Flow Diagrams: DFD-5)

Inputs:	From:
Notice of Processed Order	Distribute Data Online
Notice of Processed Order	Process Order Manually
Notice of Processed Order	NSSDC
Outputs:	**To:**
Order Confirmation to User	Send Order Confirmation Mail
Data Stores:	**Access:**
Pending Orders	writes

3.1.4.4.5 Distribute Data Online - F-5.9

The Distribute Data Online function shall accept a retrieved data set and prepare it for distribution in real time over communication links. The following methods of on line data transmission shall be supported:

1. SPAN data copies

2. Asynchronous link error free protocols

These procedures are discussed in the Support-Data-Transfer-Protocol function. The Distribute Data Online function shall prepare an Online-Data-Distribution-Request which shall identify the intended recipient, the transmission procedures requested, and the data in the Working Data Set to be transmitted.

After the data set has been successfully transferred, a Notice-Of-Processed-Order shall be issued indicating that the order has been completed. (Refer to Data Flow Diagrams:

DFD-5)

Inputs:	**From:**
Retrieve Data Notification	Retrieve Ordered Data
Retrieve Data Notification	Interpret Order Retrieve Command
Outputs:	**To:**
On Line Data Distribution Requests	Transfer Data
Notice of Processed Order	Remove Pending Order
Data Stores:	**Access:**
Working Data Set	reads

3.1.4.5 Administer System - F-6

The Administer System function shall manage all of the system activities including the facilities function, planning and scheduling function, accounting function, database administration function, and customer support function.

The Facilities (3.1.4.5.5) function shall maintain configuration control over all the system, systematically controlling changes to the configuration. This function shall also maintain integrity and traceability of the configuration during all phases of the system life cycle. This function shall initially be performed using manual procedures.

The Planning and Scheduling (3.1.4.5.2) function shall schedule system usage, times of heavy resource utilization, system down times for maintenance, and system upgrades. This function shall be performed using manual procedures.

The Accounting (3.1.4.5.3) function shall audit system operations, system performance, and system usage. The function shall also create, maintain and delete user accounts. This function shall be performed with manual procedures which utilize DEC VAX/VMS utilities whenever possible.

The Database Administration (3.1.4.5.4) function shall maintain and control access to the PDS storage hierarchy, PDS Operational Data, and the PDS Archive. This function shall enforce data and software standards to ensure data consistency and data integrity of all the PDS data. This function shall also provide and maintain data security, as required, and monitor data access accounting. This function shall utilize the DEC VAX/VMS utilities and the DBA utilities for Britton-Lee's IDM database machine whenever possible.

The Customer Support (3.1.4.5.1) function shall provide any necessary assistance to users using the PDS. This support shall include answering questions, resolving user problems, providing information about and documentation on the system, about a data order, about a data preparatio request, etc. This function shall also accept and process requests for new user accounts and IDs. This function shall be performed using manual procedures. (Refer to Data Flow Diagrams: DFD-0)

Inputs:	**From:**
Data and Software Agreement from Supplier	PDS Data Suppliers
Outputs:	**To:**
User Education Materials	PDS Users
Data and Software Agreement from System	PDS Data Suppliers
Data Stores:	**Access:**
Operational Planetary Data	reads
Planetary Data Archive	reads
Operational Planetary Data	writes
Planetary Data Archive	writes

3.1.4.5.1 Customer Support - F-6.1

The Customer Support function shall perform the following functions:

1. Answer questions. A user consultant shall be available during normal working hours (Monday - Friday, 8:00 to 4:45 PST) to assist users in their use of PDS. Members of the PDS development staff shall be available as consultants on a limited basis for any questions the consultant cannot answer.

2. Handle complaints

3. Process error reports. A failure reporting system shall be developed and maintained, using the DBMS. Software and data problems, and their resolutions, shall be logged and tracked.

4. Process enhancement requests using a Change Control Board (CCB) as specified in the PDS Configuration Management Plan.

5. Process hardware failure reports. Hardware problems and their resolutions shall be logged and tracked.

6. Process documentation requests.

7. Answer data order status inquiries.

8. Answer data preparation status inquiries.

9. Expedite user requests.

10. Perform system status checks.

11. Process science inquiries. The user consultant shall have a list of user

consultants at each of the discipline nodes for the various data sets contained in PDS. Users having questions about the data shall be referred to the appropriate user consultant if the general PDS user consultant cannot answer the question.

12. Handle requests for setting system parameters

13. Process requests for user IDs

14. Set up user accounts

The Customer Support function shall provide a mechanism for registering users with the accounting system, and initializing user account authorizations or limits. (Refer to Data Flow Diagrams: DFD-6)

Inputs:	**From:**
Facilities Status Response	Facilities
User Inquiry	PDS Users
Outputs:	**To:**
Facilities Status Query	Facilities
User Education Materials	PDS Users
User Inquiry Response	PDS Users
Data Stores:	**Access:**
User Accounts	reads
Customer Support Records	reads
System Schedule	reads
Customer Support Records	writes
System Schedule	writes
User Accounts	writes

3.1.4.5.1.1 Route User Request - F-6.1.1

The Route User Request function shall route user inquiries and requests to the appropriate customer support functions. This function shall be handled manually by the PDS User Consultant operator. The consultant shall receive user inquiries from PDS users via either the telephone or the PDS electronic mail (i.e. VAX mail, TELEMAIL). The consultant shall verify information in the user inquiry, categorize the inquiry and enter the inquiry into a customer inquiry log. Then the operator shall forward the user inquiry/request to one of the following customer support functions: Register Users (3.1.4.5.1.2), Consult on System Usage (3.1.4.5.1.3), Consult on Data Usage (3.1.4.5.1.4), and Prepare User Education Manual (3.1.4.5.1.5). (Refer to Data Flow Diagrams: DFD-6.1)

Inputs:	From:
User Inquiry	PDS Users
User ID Questions	Register Users
System Status Response	Consult on System Usage
Science Data Inquiry Response	Consult on Data Usage
Documentation Request Response	Prepare User Education Manual
Customer Service Response	Access User Inquiry Mail
Outputs:	**To:**
User ID Response	Register Users
User ID Request	Register Users
System Status Checks	Consult on System Usage
Science Data Inquiries	Consult on Data Usage
Documentation Request	Prepare User Education Manual
Customer Service Inquiry	Access User Inquiry Mail
User Inquiry Response	PDS Users
Data Stores:	**Access:**
Customer Support Records	reads
Customer Support Records	writes

3.1.4.5.1.2 Register Users - F-6.1.2

The Register Users function shall register new users, give them a user account, and obtain User Information (B.186). This function shall collect at least the following information: user name, organization, address, telephone number, electronic mailbox name, user terminal, hardware and software configuration at user site, desired distribution media, user affiliation, and user charge numbers (or accounting information).

The Register Users function shall be performed by the customer support staff interactively utilizing VAX/VMS operating system utilities and some limited developed DBMS capabilities (i.e., menus to the required system support databases).

The Register Users function shall provide a mechanism for registering users with the accounting system, and initializing user account authorizations and limits. This function shall validate the new user account request against an authorized list of users provided by NASA Headquarters and/or the PDS management council. If the user's name is not on the authorized list, the customer support personnel shall collect any further information required and initiate a request to PDS Management to review and determine whether the new user account shall be authorized.

The Register Users function shall also verify the User Information (B.186) before entering the data into the User Profile (B.191) database. The mailing address of the user shall be included to provide a default address for the mailing of data products. In addition, the User Profile (B.191) database be maintained in the DBMS and shall contain information about the user's hardware (terminal types and local computer system) and the products the user has previously requested. This database shall be used for the following purposes: a) to tailor the I/O interface to make good use of the user's hardware (e.g.,

graphics terminal), b) to provide defaults for some request parameters (e.g., magnetic tape density), and c) to provide statistics on the types of requests users make. This function shall also be responsible for maintaining the User Profile (B.191) database of users utilizing the facilities of the DBMS.

This function shall validate the accounting information and the charge numbers given by the user to determine what authorizations and financial resources the user has available for ordering data and data processing from the system. This accounting information shall be entered by the customer support staff via a input menu into the User Accounts (B.180) database which shall be under DBMS control. (Refer to Data Flow Diagrams: DFD-6.1)

Inputs:	**From:**
User ID Response	Route User Request
User ID Request	Route User Request
Outputs:	**To:**
User ID Questions	Route User Request
Data Stores:	**Access:**
User Accounts	reads
User Profile	reads
User Accounts	writes
User Profile	writes

3.1.4.5.1.3 Consult on System Usage - F-6.1.3

The Consult on System Usage function shall advise users on the status of the operational system and the near term schedule of system operations. It shall also accept and resolve user complaints, system error reports and hardware failure reports. This function shall provide information to the user on the use of the system, such as how to set system parameters. The Consult on System Usage function shall be performed interactively by the customer support staff and/or the system support staff utilizing the vendor provided VMS operating system utilities and the DBMS utilities.

The Consult on System Usage function shall perform system status checks of all major components of the operational system. Upon request, it shall provide to the user information on the status of the operational system and on the near-term schedule of operations.

The Consult on System Usage function shall receive user complaints, system error reports and hardware failure reports. The user complaints shall be reviewed to determine the nature of the complaint. If an error exists in the system, then customer support personnel shall produce a system error report and the report shall be processed as defined in the PDS Operations Plan. If the complaint involves the design of the system, then the user complaint shall be forwarded to the PDS Change Control Board for their review as specified in the PDS Configuration Management Plan. The customer support staff shall log all system error reports and all hardware failure reports in the system database under DBMS control. The staff shall attempt to resolve all system errors identified in the error

reports. If the problem requires a major change to the system or the staff can not resolve the problem, then the error report shall be sent to the Change Control Board for resolution. The VAX manager shall resolve all system hardware failures. If the hardware failure can not be resolved, then the designated vendor shall be brought in to fix the hardware. The user shall be notified that his report has been received, and when the problem has been resolved, the user shall be notified of the resolution.

The Consult on System Usage function shall receive and evaluate all requests from users that involve changes to the system. Enhancement requests shall be sent to the Change Control Board for its review. (Refer to Data Flow Diagrams: DFD-6.1)

Inputs:	**From:**
System Status Checks	Route User Request
Facilities Status Response	Route User Request
Facilities Status Response	Facilities
Outputs:	**To:**
System Status Response	Route User Request
Facilities Status Query	Facilities
Data Stores:	**Access:**
System Schedule	reads
System Schedule	writes

3.1.4.5.1.4 Consult on Data Usage - F-6.1.4

The Consult on Data Usage function shall handle all inquiries about science data sets, the status of data orders, and the status of data preparation. The customer support staff shall have a list of user consultants at each of the discipline nodes for the various data sets contained in the operational PDS. A user consultant for each data set shall be selected by the discipline node that is responsible for that designated data set. The consultant shall reside at that discipline node and shall be available to answer data set questions from users for a minimum of eight hours per week. Users having questions about the data shall be referred to the appropriate user consultant if the general PDS user consultant cannot answer the question. The customer support staff at the central node shall be trained to handle basic and frequently asked questions. However, any complex science question shall be forwarded to the appropriate user consultant.

The user consultants shall advise users on the availability, and location of science data by accessing the catalog and stock record inventory via the Inspect Data (3.1.4.2) function. The customer support personnel shall also instruct them, when needed, on the use of the Inspect Data (3.1.4.2) function so that the users will be able to retrieve this information for themselves the next time.

The Consult on Data Usage function shall answer data order status inquiries and data preparation status inquiries. The customer support staff shall access the Pending Orders (B.120) file in the DBMS and shall determine the status of the user's order. Then this information shall be given to the user. If any problem occurs, the user consultant shall initiate any actions necessary to resolve the problem or to expedite the user's order, as

needed. (Refer to Data Flow Diagrams: DFD-6.1)

Inputs:	**From:**
Science Data Inquiries	Route User Request
Outputs:	**To:**
Science Data Inquiry Response	Route User Request
Data Stores:	**Access:**
High Level Catalog	reads
Pending Orders	reads

3.1.4.5.1.5 Prepare User Education Manual - F-6.1.5

The Prepare User Education Manual function shall prepare and maintain any required user education material (e.g. user manuals) and shall fill requests for system documentation. This function shall be responsible for preparing and maintaining a PDS User's Manual. The PDS User's Manual shall be available in both a hardcopy form and an on line form for direct user access, if necessary. This function shall also prepare other educational material as specified in the PDS Software Management Plan such as a training manual, a canned demo for the users to execute, and a quick reference guide.

This function shall be responsible for maintaining a library of and a master copy of all Planetary Data System documentation. Distribution of copies of PDS documentation shall be handled by this function upon request. For those requests that involve internal system documentation, this function shall validate whether the user who made the request is authorized to receive this information. This function shall be handled manually by the operator who shall access PDS customer support files in the DBMS when necessary.

The Customer Support Personnel working on this function shall be prepared to help train new users coming onto the system and to provided demonstrations of the PDS as the need arises. (Refer to Data Flow Diagrams: DFD-6.1)

Inputs:	**From:**
Documentation Request	Route User Request
Outputs:	**To:**
Documentation Request Response	Route User Request
User Education Materials	PDS Users
Data Stores:	**Access:**
Documentation Library	reads
Documentation Library	writes

3.1.4.5.1.6 Access User Inquiry Mail - F-6.1.6

The Access User Inquiry Mail function shall receive customer service inquiries and send them to the user via an electronic mail message. These mail messages shall be store in the Pending Mail (B.119) file until the user signs on to read them. The function shall also receive customer service responses from the user, retrieve them from the Pending Mail (B.119) file and forward them to the Route User Request (3.1.4.5.1.1) for processing. The manual functions of the system shall use the sanctioned electronic mail systems (i.e. VAX MAIL or TELEMAIL) to communicate with the users as needed. This function shall be performed by the customer support personnel who shall retrieve all user inquiries and requests for customer support from the electronic mail system on a daily basis or up to three times daily, if the need warrants it. (Refer to Data Flow Diagrams: DFD-6.1)

Inputs:	**From:**
Customer Service Inquiry	Route User Request
Outputs:	**To:**
Customer Service Response	Route User Request
Data Stores:	**Access:**
Pending Mail	reads
Pending Mail	writes

3.1.4.5.2 Planning and Scheduling - F-6.2

The Planning and Scheduling function shall schedule the following: heavy system use periods, extended system down time, and system upgrades. The function shall be performed using manual procedures.

The Planning and Scheduling function shall review schedules for the following: major planetary science conventions and conferences, node development and science analysis, and system development activities to determine known and potential heavy system use periods. These heavy use periods shall be entered and maintained in the system schedule. After an event has occurred the schedule entries shall be deleted.

The Planning and Scheduling function shall review system performance reports, issue system resource queries concerning system capacities, receive system resource responses, and develop system upgrade plans for system hardware, software, and other system resources. These plans shall be submitted to the PDS Change Control Board for its approval. Any extended system down time or period of system degradation associated with implementing a system upgrade shall be entered and maintained in the system schedule. After an event has occurred, the schedule entries shall be deleted.

The Planning and Scheduling function shall also evaluate resource allocations or reallocations based on system performance reports, system resource queries, and planned system upgrades. Any system resource reallocation requests shall be submitted to the PDS Change Control Board in the form of system upgrade plans. (Refer to Data Flow

Diagrams: DFD-6)

Inputs:	**From:**
System Performance Reports	Accounting
Recommendation for Resource Allocation	Accounting
System Resources Response	Facilities
Outputs:	**To:**
System Resources Query	Facilities
System Upgrade Plans	Facilities
Data Stores:	**Access:**
System Schedule	reads
System Schedule	writes

3.1.4.5.3 Accounting - F-6.3

The Accounting function shall create, maintain, and delete user accounts; capture, maintain, summarize, and delete system performance measures; and audit system operations. These functions shall be performed by manual procedures, and are further described below.

The Accounting function shall create and maintain user accounts in an easily accessible and maintainable form. All user transactions during data inspection, data ordering, and customer services shall be logged. Each transaction type shall have an associated charge based on the system resources consumed. All charges shall be debited to the user's account. Invoices shall be issued periodically (e.g. every thirty days) to the users detailing their account activity during the period. All user account payments shall be credited to the account as received.

A closed-loop system of paper invoices shall be established to maintain constant visibility into the status of all shipped products. Status information shall be maintained in the user accounts.

Users shall be issued a number of user credits to their account at the initiation of the account. A user shall not incur real charges until the user credits are exhausted.

For every user order request that has been scheduled for execution, the system shall maintain a history of the progress of the request, an indication of the current status, accumulated resource usage and estimated completion time of the request. When a requested product leaves the control of the system (i.e., a tape volume is written, then demounted and packaged for shipment), its status shall be tracked by manual means and recorded in the request history.

The Accounting function shall analyze system performance by inspecting parameters captured in logs by the system functions, the hardware and software configuration items, and other selected system components at all the nodes.

A variety of data collection monitors shall be provided as needed for optimization of system design and operating parameters. This shall include such things as CPU and I/O channel usage monitors, telecommunication subsystem status and load monitors, and operating system queue monitors.

These performance parameters shall be analyzed periodically for the purpose of determining areas where system performance could be improved. Examples are the reorganization of heavily used data sets or subsets, consolidation of frequently used sequences of functions, and operating system tuning. Two specific periodic outputs of this function shall be Data Usage Patterns (B.50) and the System Performance Reports (B.164) report. The data usage patterns shall show which data sets were accessed and how often during the last period. The system performance report shall summarize the performance parameters captured during the last period.

The Accounting function shall periodically audit system operations and report on the following: unpaid user bills, unfilled data orders, unfinished data preparation, and excessive resource consumption by user accounts.

On a periodic basis (e.g., every 30 days), the user accounts shall be reviewed. All user accounts which have accumulated excessive usage (200% over the system-wide average use) shall be investigated to determine if user privileges are being abused. Under recommendation from the audit function, a user may be issued a warning, user privileges may be reduced, or a user account may be terminated.

Upon request, the Accounting function shall provide a detailed accounting of the usage of system resources by each user account.

On a periodic basis (e.g., every 15 days), the data order log shall be reviewed to find data orders which have been in progress for over 15 days. These orders shall be flagged and expedited. Orders which are older than 30 days shall be investigated to determine the cause of the delay. Also, a recommendation shall be issued for the allocation of additional resources to complete the data order.

On a periodic basis (e.g. every 30 days) the data preparation log shall be reviewed to find data preparation tasks which have been in progress for over 30 days. These tasks shall be flagged and expedited. Tasks which are older than 60 days shall be investigated to determine the cause of the delay. Also, a recommendation shall be issued for the allocation of additional resources to complete the data preparation. (Refer to Data Flow Diagrams: DFD-6)

Inputs:	**From:**
None	
Outputs:	**To:**
System Performance Reports	Planning and Scheduling
Recommendation for Resource Allocation	Planning and Scheduling
Data Usage Patterns	Database Administration
Data Usage Patterns	Maintain Storage Hierarchy

Data Stores:	Access:
User Accounts	reads
System Performance Measures	reads
Customer Support Records	reads
User Accounts	writes
System Performance Measures	writes

3.1.4.5.4 Database Administration - F-6.4

The large and varied amount of data that PDS plans to acquire presents a challenge that will require the establishment of principles, and organizational and technical solutions. Effective data resource management shall be a crucial element in PDS development. Two important areas of data resource management shall be data administration and database administration. Data Administration (DA) is defined as the establishment and enforcement of policies and procedures for managing data as a globally administered and standardized resource which includes collection, storage, and dissemination of data. Database Administration (DBA) is a function concerned with the technical design and maintenance of the databases used in a system.

The Database Administration function shall perform the following data administration functions:

1. Maintain and enforce data standards (see Acquire Data (3.1.4.5.4.6)) as specified in the PDS Product Assurance Plan.

2. Maintain and enforce the software standards (see Acquire System Software (3.1.4.5.4.7)) specified in the PDS Software Management Plan and the PDS Product Assurance Plan.

These two data administration functions shall be handled manually and shall include standards, policies, and procedures for database development, data integrity, security and privacy controls, and PDS standard data formats.

The Database Administration function shall perform the following database administration functions:

1. Maintain Storage Hierarchy (3.1.4.5.4.1)

2. Maintain Online PSD (3.1.4.5.4.3)

3. Maintain Archive (3.1.4.5.4.2)

4. Maintain Data Integrity (3.1.4.5.4.4)

5. Monitor Data Accounting (3.1.4.5.4.5)

These functions shall be used by the database administration staff to maintain all PDS data. The responsibilities of the PDS operator shall also include DBMS software installation, maintenance, optimization of data storage and data access, data security, database design and any database back-up and recovery procedures required. These

functions shall utilize the DBA utilities of the selected DBMS whenever possible. (Refer to Data Flow Diagrams: DFD-6)

Inputs:	**From:**
Data Usage Patterns	Accounting
User Inquiry	PDS Users
Solicitation for Data to Include	PDS Data Suppliers
Solicitation to Include Software	PDS Data Suppliers
Software Standards for Submission	PDS Data Suppliers
Data Standards for Submission	PDS Data Suppliers
MOU	PDS Data Suppliers
Solicitation for Software to Include	PDS Data Suppliers

Outputs:	**To:**
Solicitation for Data to Include	PDS Data Suppliers
MOU	PDS Data Suppliers
Solicitation for Software to Include	PDS Data Suppliers
Software Standards for Submission	PDS Data Suppliers
Data Standards for Submission	PDS Data Suppliers

Data Stores:	**Access:**
Planetary Science Data	reads
User Accounts	reads
Planetary Science Data	writes
User Accounts	writes

3.1.4.5.4.1 Maintain Storage Hierarchy - F-6.4.1

The Maintain Storage Hierarchy function shall evaluate data usage patterns and determine if the accessibility of the data sets should be increased or decreased b moving them up or down the storage hierarchy.

The Maintain Storage Hierarchy function shall be performed by the database administration staff. They shall utilize the stock record inventory, the session log, and the DBMS statistic relations to determine the current locations of data and the data usage patterns. Using this information, they shall prioritize the PDS data sets in order of most frequently used. This lis shall then be compared with the criticality of data sets as defined by the PSDSG and PDS management. Based upon this evaluation, the Database Administration staff shall make a determination as to whether various data sets should be stored on line for faster accessibility or off line. The amount of available data storage resources shall determine how much PDS data can be stored on line. Those PDS data sets that are determined to be critical and/or most frequently accessed by users shall be stored on line. As its importance or its usage becomes less, the data set shal be moved to off line media that will be available for staging to on line storage if a user requests. The data sets that are of low priority and are infrequently requested by users shall be stored in the Planetary Data Archive (B.122) and shall be available only by ordering the data.

When the PDS operator determines that a data set needs to be brought on line, this function shall initiate an Order for Restore (B.113) that shall be sent to Maintain Archive

(3.1.4.5.4.2) and an Order for Data Storage Change (B.112) that shall be sent to Maintain Online PSD (3.1.4.5.4.3).

When the DBA staff determines that a data set needs to be relocated to off line storage, this function shall initiate an Order for Data Storage Change (B.112) that shall then be sent to Maintain Online PSD (3.1.4.5.4.3). (Refer to Data Flow Diagrams: DFD-6.4)

Inputs:	**From:**
Data Usage for DBMS Data	Monitor Data Accounting
Data Usage Patterns	Accounting
Restore Error Message	Maintain Online PSD
Outputs:	**To:**
Order for Restore	Maintain Archive
Order for Data Storage Change	Maintain Online PSD
Data Stores:	**Access:**
Operational Planetary Data	reads
Operational Planetary Data	writes

3.1.4.5.4.2 Maintain Archive - F-6.4.2

The Maintain Archive function shall maintain the planetary science data archive refurbishing the archive contents and serving as its curator. It shall also respond to requests for restoration by providing a copy of the requested data to be restored. This function shall be performed manually by either the DBA or the PDS operator staff using VAX/VMS utilities whenever possible.

The Planetary Data Archive (B.122) shall be composed of two parts: 1) a master copy of each of the planetary science data sets, specified in Appendix C, stored in a deep archive, and 2) a second copy of each PDS data set for off line storage that shall be used by the PDS in day to day operations. For PDS Version 1.0, these archives shall be managed and maintained at the central node and shall be limited to only those PDS data sets selected as high priority for Version 1.0 (see Appendix C). In the future, the deep archive may be maintained at another facility and shall include all meaningful planetary science data sets. Also then, the off line storage, maintained at the central node, shall contain a copy of each supported PDS data set. This off line storage shall be used for restoring requested digital or analog data to on line accessibility and for supplying data to fill data orders. The off line storage shall also contain non-machine readable data products that are maintained by PDS for distribution. Data sets that are in the deep archive shall be retrieved only when to restore the off line copy of the data set.

For PDS Version 1.0, the Maintain Archive function shall maintain a master copy of every PDS critical data set (see Appendix C). This function shall include procedures for the curation and refurbishing of all the master copies of the data sets. These procedures shall be performed by the DBA utilizing DEC VAX/VMS utilities.

The Maintain Archive function shall also accept and process an Order for Restore (B.113). The function shall receive and validate this order. It shall then retrieve the

requested data and send this data via a Data for Restore (B.54) to the Maintain Online PSD (3.1.4.5.4.3) function where the data shall be brought on line. (Refer to Data Flow Diagrams: DFD-6.4)

Inputs:	**From:**
Order for Restore	Maintain Storage Hierarchy
Outputs:	**To:**
Data for Restore	Maintain Online PSD
Data Stores:	**Access:**
Planetary Data Archive	reads
Planetary Data Archive	writes
Operational Local Archive	writes

3.1.4.5.4.3 Maintain Online PSD - F-6.4.3

The Maintain Online PSD function shall maintain and track all on line planetary science data (PDS). The function shall accept and process an Order for Data Storage Change (B.112). This capability shall be performed by the database administration staff using the VAX/VMS utilities and the DBMS DBA utilities.

If the Order for Data Storage Change requests a data set to be relocated to off line storage, this function shall validate that a copy of the data set exists in the Planetary Data Archive (B.122). Then the DBA shall delete the on line version of the data set and shall update the Operational Planetary Data (B.107) using the DBMS capabilities.

If the Order for Data Storage Change requests a data set to be relocated to on line storage, this function shall validate that a data schema exists for the data set and that the correct amount of on line storage resources exist to accommodate the data set. If a schema does not exist for the data set, the DBA shall make a request to the PDS Change Control Board requesting the Data Management Team to develop a schema. This function shall notify the Maintain Storage Hierarchy (3.1.4.5.4.1) via a Restore Error Message (B.135) that the Order for Restore (B.113) has been placed on hold while a schema is developed for the data set. If the correct amount of on line storage is not available, this function shall notify the Maintain Storage Hierarchy (3.1.4.5.4.1) via a Restore Error Message (B.135) that the Order for Restore (B.113) can not be serviced because of insufficient storage capacity.

The Maintain Online PSD function shall receive the Data for Restore (B.54) from the Maintain Archive (3.1.4.5.4.2) function. If a valid schema exists for the data set and there is enough available on line storage capacity, then the function shall bring the data set on line and shall store it either in a database under the DBMS control or in a VMS file under VMS control. The primary mode of storing data on line shall be storing data under DBMS control. Only data sets that do not lend themselves to the relational model (i.e. imag data and spectrum data) shall be stored in VMS files. This function shall utilize the same data store (loading) routines that are used in the Service Data Storage Requests (3.1.4.6.5.7) to store data on line. If a valid schema does not exist but is being developed for the data set, then the function shall place the order and data on hold until the schema is available.

The Maintain Online PSD function shall perform procedures for database recovery and reorganization through back-up dumps, reloads, and audit trails. This function shall also perform the day to day operational backups as defined by the PDS Operations Plan. These capabilities shall be performed by the DBA using the available DBMS and VAX/VMS utilities.

The Maintain Online PSD functions shall include procedures to be performed by the DBA to monitor database performance by reviewing the data usage patterns and to respond to user complaints about response times. When necessary, this function shall perform tuning, optimization and reorganization of the database as required for improved performance. Performance tuning shall be performed by the DBA utilizing the DBMS capabilities. (Refer to Data Flow Diagrams: DFD-6.4)

Inputs:	**From:**
Data for Restore	Maintain Archive
Order for Data Storage Change	Maintain Storage Hierarchy
Outputs:	**To:**
Restore Error Message	Maintain Storage Hierarchy
Data Stores:	**Access:**
Operational Planetary Data	writes

3.1.4.5.4.4 Maintain Data Integrity - F-6.4.4

The Maintain Data Integrity function shall include procedures for maintaining data integrity within the PDS Storage Hierarchy. The function shall ensure that the data are checked periodically using the integrity check procedures. This function shall be performed by the DBA staff and the user consultants that are responsible for the various data sets. Wheneve possible, they shall utilize the DBMS capabilities to perform the integrity check procedures. In addition, this function shall ensure that any discovered problem areas are corrected. These problems shall be resolved by the DBA staff or the user consultants using the DBMS capabilities where applicable. (Refer to Data Flow Diagrams: DFD-6.4)

Inputs:	**From:**
None	
Outputs:	**To:**
None	

Data Stores:	Access:
Operational Planetary Data	reads
Operational Planetary Data	writes

3.1.4.5.4.5 Monitor Data Accounting - F-6.4.5

The Monitor Data Accounting function shall facilitate and control the acquisition of information from the Operational Planetary Data (B.107). This function shall provide security and privacy controls on all data stored on line or off line in the PDS. This function shall provide new users access to databases upon the user account authorization information retrieved from the User Accounts (B.180). For data stored on line in the DBMS, this function shall utilize the security and privacy control capabilities of the DBMS to provide users access to data they are authorized to see and to prevent unauthorized access to secured data sets. For data stored on line in non-DBMS form (VAX/VMS file structure), the function shall utilize the security control capabilities of the VAX/VMS operating system. Security controls shall be maintained manually by the PDS operators for off line data and for the Planetary Data Archive.

The Monitor Data Accounting function shall also assist in the monitoring of user access to the data. This capability shall include procedures to monitor all access to the data via the VAX system journaling and accounting functions, and the DBMS journaling and data usage functions. These procedures shall be used by the DBA staff to review and make recommendations to the Maintain Storage Hierarchy (3.1.4.5.4.1) for changes to the data storage hierarchy or for performance tuning of the various databases. (Refer to Data Flow Diagrams: DFD-6.4)

Inputs:	From:
None	
Outputs:	**To:**
Data Usage for DBMS Data	Maintain Storage Hierarchy
Data Stores:	**Access:**
Operational Planetary Data	reads
User Accounts	reads

3.1.4.5.4.6 Acquire Data - F-6.4.6

The Acquire Data function shall solicit additional planetary data for inclusion into the system and shall handle administrative aspects of acquiring new data sets. This function shall also develop, maintain, and distribute the PDS data standards, and shall facilitate and monitor the conversion of submitted planetary science data into operational planetary data.

The Acquire Data function shall be performed manually by the Data Administration

(DA) team. The DA team shall be composed of a Data Administrator who heads the team, the DBA staff and a representative from each discipline node. It shall be the responsibility of the DA team to negotiate the memorandums of understanding (MOU's) for each data set with the data producers (or data suppliers). The DA team shall also be responsible for determining what procedures are necessary to incorporate each new data s into the PDS and then to coordinate these procedures.

The Acquire Data function shall accept a Solicitation to Include Data (B.154) from PDS users, NASA Headquarters, PSDSG and PDS management. The request shall be validated and then this function shall send a Solicitation for Data to Include (B.152) and the Data Standards (B.48) to the responsible data supplier requesting the data set and information on the data set. This function shall collect from the supplier the following information: documentation on the data set, science data formats, data integrity constraints, required security and privacy controls, and additional data dictionary terms and definitions, if necessary. This function shall ensure that all submitted data sets conform to the PDS Data and Documentation Standards. (Refer to Data Flow Diagrams: DFD-6.4)

Inputs:	**From:**
Solicitation to Include Data	PDS Data Suppliers
Outputs:	**To:**
Solicitation for Data to Include	PDS Data Suppliers
MOU	PDS Data Suppliers
Data Standards for Submission	PDS Data Suppliers
Data Stores:	**Access:**
Data Standards	reads
Data Standards	writes

3.1.4.5.4.7 Acquire System Software - F-6.4.7

The Acquire System Software function shall solicit additional software for inclusion into the system and handle the administrative aspects of acquiring this new software. This function shall also develop, maintain, and distribute the PDS software development standards as specified in the PDS Software Management Plan, and shall facilitate and monitor the conversion of submitted supporting planetary science software into an operational software library.

As necessary, this function shall also evaluate all software interfaces related to the PDS central database to ensure that there is no interaction detrimental to the overall system performance, and shall analyze and evaluate the effect of planned application programs on the database design and performance. (Refer to Data Flow Diagrams: DFD-6.4)

Inputs:	**From:**
Solicitation to Include Software	PDS Data Suppliers
Outputs:	**To:**
Solicitation for Software to Include	PDS Data Suppliers
Software Standards for Submission	PDS Data Suppliers
MOU	PDS Data Suppliers
Data Stores:	**Access:**
Software Standards	reads
Software Standards	writes

3.1.4.5.5 Facilities - F-6.5

The Facilities function shall perform two major functions. First, it shall identify the configuration of the system as specified in the PDS Configuration Management Plan in order to systematically control changes to the configuration. Second, it shall maintain the integrity and traceability of the configuration throughout the installation, operations, and maintenance phases of the system life cycle. The above functions shall be accomplished primarily using manual procedures, and shall include configuration identification, configuration control, configuration status accounting, and configuration auditing. These functions are defined in detail in the PDS Configuration Management Plan and are only summarized below.

The configuration identification shall begin with a product baseline to be established at the end of the development phase. The baseline shall include the hardware configuration items (HWCIs), computer software configuration items (CSCIs), and supporting documentation for the PDS Version 1.0 system. The identified configuration shall be stored in an easily accessible and maintainable form. This baseline shall form the basis for all further configuration identification. The procedure for performing configuration identification shall be defined in the PDS Configuration Management Plan.

The configuration control function shall originate, prepare, evaluate, and approve or disapprove all change proposals affecting the system's configuration items and documentation. In addition, plans for system upgrade shall be evaluated. The procedure for formally defining, evaluating, approving or disapproving, and controlling a proposed change shall be defined in the PDS Configuration Management Plan.

The configuration status accounting function shall track and report on all hardware and software configuration items which are formally identified and controlled. This function shall also accept system status queries and system resource queries inquiring about the operational status and capacities of the configuration items. The current operational status shall be reported in the form of system status responses or system resource responses. The procedure for tracking and reporting on configuration items shall be defined in the PDS Configuration Management Plan.

The configuration auditing function shall determine the degree to which the current state of the system mirrors the system identified in the baseline. The procedure for

making this determination shall be defined in the PDS Configuration Management Plan. Any discrepancies found as a result of auditing shall be resolved and the current system configuration shall be updated. (Refer to Data Flow Diagrams: DFD-6)

Inputs:	**From:**
Facilities Status Query	Customer Support
Facilities Status Query	Consult on System Usage
System Resources Query	Planning and Scheduling
System Upgrade Plans	Planning and Scheduling
Outputs:	**To:**
Facilities Status Response	Customer Support
Facilities Status Response	Consult on System Usage
System Resources Response	Planning and Scheduling
Data Stores:	**Access:**
Configuration Database	reads
Configuration Database	writes

3.1.4.6 Prepare Data - F-7

The Prepare Data function shall provide the mechanism by which data enters the PDS. In general, this function will address a "data package" consisting of several components which are necessary to interpret a set of instrument data. Components may include telemetry data records, instrument specific data sets, calibration data, ancillary data (SEDR's), processing software for data access, calibration, display or analysis, and documentation including sample products such as listings, plots, or graphic displays of analysis results.

The Prepare Data function can be considered as a **joint effort** between the data supplier and the PDS. For Version 1.0, the data suppliers shall be limited to the science testbeds (prototype discipline/data nodes) participating in PDS development. The data supplier has considerable expertise in the current status, format, and system dependent peculiarities of existing data sets. The PDS data preparation staff shall have a knowledge of standards for data archiving, formats needed for loading the PDS database, and conversion tools (data format conversion, media conversion) which shall be available to support the Prepare Data function.

The Prepare Data function shall be initiated as a result of a negotiated agreement (MOU (B.89)) between the PDS data administrator and the data supplier. The Acquire Data (3.1.4.5.4.6) and Acquire System Software (3.1.4.5.4.7) functions shall result in a data preparation agreement which specifies explicitly the processing to be performed by the supplier, the format and content of delivered data, and the documentation and software to be provided.

The data administrator shall be involved in the negotiations and development of this agreement to ensure that the total amount of work to be performed by the supplier and the PDS Prepare Data function is minimized. Due to the fragile nature of many older planetary data sets, the preparation staff shall also assure that appropriate safeguards (as

specified in the PDS Data Administration Plan) are taken at data preparation sites to assure that no data is inadvertently destroyed.

Sub-functions of the Prepare Data function shall include checking the received data set format, correcting the format if necessary, reviewing the science data content, evaluating the accompanying software, conducting a peer review of the prepared data set, and storing accepted data sets in the PDS storage hierarchy.

Under normal circumstances, the data supplier shall perform the following functions in preparing data sets for PDS:

Data Set Documentation

1. Collect and organize existing documentation and convert the documentation to machine readable format for entry into the PDS catalog.

2. Provide a complete bibliography and copies of existing documents that describe the following: instrument design and operation, data sets and their formats, calibration requirements, processing operations performed on the data, and scientific results of instrument data analysis.

3. Provide data format descriptions for all machine readable data sets indicating the source of the data (computer, operating system) structure, the format, length, and description of every data item in the data set, and whenever possible, the maximum and minimum values for each data item in the data set.

4. Provide sample data products illustrating the use of the data set in scientific analysis.

Catalog

1. Prepare a machine-readable index which identifies the physical storage location (tape and file number or volume and data set name), and data content of the restored data. As a minimum, this index must provide observation identification and data acquisition time tags (event time and spacecraft clock time if applicable) for logical groupings of instrument data.

Reformatted Data Sets

1. Convert all telemetry, instrument, ancillary, or calibration data to standard PDS (possibly SFDU) format on 9-track, 1600 or 6250 bpi magnetic tape, and submit a copy of the tape data set to the PDS central node. Storage formats on tape shall be in VAX "copy" or "backup" format or standard ANSI labelled format.

2. Provide all text material contained in reformatted data sets in ASCII format.

3. Provide numeric formats in a format consistent with the data descriptive capabilities of the PDS Data Definition Language (DDL).

Processing Software

1. Provide a software set capable of accessing the instrument data from the

restored tapes and of applying calibration procedures and data files to the instrument data.

2. Provide the software in either VAX FORTRAN, or "C," as negotiated in the data preparation agreement (MOU (B.89)). The name, address, and phone number of the current cognizant programmer for the software set shall also be provided.

Processing Status/Results

1. Provide a final report describing the methodology, hardware, software, and personnel involved.

2. Provide, in the above report, a summary of the products of the effort, liens or work which could not be accomplished, recommendations for further work, and statistics of the processing activity (tapes/data bits processed, tapes/data bits restored, resource requirements including computer time, work-months and media cost).

Standards for data set preparation procedures and products shall be identified in the PDS Data Administration Plan. (Refer to Data Flow Diagrams: DFD-0)

Inputs:	**From:**
Submitted Science Data and Software	PDS Data Suppliers
Request to Stage Data	Distribute Data
Request to Stage Data	Inspect Data
Outputs:	**To:**
Rejected Data and Software	PDS Data Suppliers
Data Stores:	**Access:**
Operational Planetary Data	reads
Planetary Data Archive	writes
Operational Planetary Data	writes

3.1.4.6.1 Check Data Format - F-7.1

The Check Data Format function shall review the format of the science data submitted for inclusion into the PDS. The function shall also attempt to correct minor data format problems as necessary. Submitted data shall be rejected and returned to the supplier if it does not meet the standards established in the PDS Product Assurance Plan.

The first step, upon receiving a data set, shall be to evaluate the format of the data on its submission media. If the format is unrecognizable, then the data set documentation shall be checked. If the format of the data is adequately described, it shall be evaluated for correctability; otherwise, the data set shall be rejected. If a data set is submitted in non-digital format and a digital format is required, it shall be converted by the Convert Media (3.1.4.6.1.5) function.

Next, the format shall be reviewed to determine if it conforms to the PDS data format standards. If the data set conforms, it shall be passed to the Check/ Sample Data Content (3.1.4.6.2) function; otherwise, it shall be evaluated for correctability. If the format of a data set is not readily correctable, the data administrator and data preparation staff shall prepare a summary of the requirements for performing the correction which shall be reviewed by project management prior to any correction or data set rejection actions. If the problem can be easily corrected, the data set shall be reformatted and/or converted by the Convert Media (3.1.4.6.1.5) function and the Convert Data Type (3.1.4.6.1.7) function into the PDS data format standard. (Refer to Data Flow Diagrams: DFD-7)

Inputs:	**From:**
Submitted Science Data	PDS Data Suppliers
Outputs:	**To:**
Data Set with Agreed Format	Check/ Sample Data Content
Rejected Data with Format Error	PDS Data Suppliers

3.1.4.6.1.1 Evaluate Format - F-7.1.1

The Evaluate Format function shall accept submitted science data and determine if the data is in machine-readable format and whether the format is recognizable based on the PDS data format standards. A recognizable format shall consist of an ANSI or PDS labelled data set, identifying the data file contents in the collection.

If a data set is not in a recognizable format, it shall be sent to the Check Documentation (3.1.4.6.1.3) function. If the data set has a recognizable format, it shall be passed on to the Review Data for Correct Format (3.1.4.6.1.2) function. Data sets which are not in machine-readable format (printed documentation, plots, graphics, listings) shall be sent to the Convert Media (3.1.4.6.1.5) function. All non-machine-readable data shall be identified in the data preparation agreement between the supplier and the PDS data administrator with explicit instructions regarding PDS responsibilities for media conversion. (Refer to Data Flow Diagrams: DFD-7.1)

Inputs:	**From:**
Transcribed Data	Convert Media
Submitted Science Data	PDS Data Suppliers
Outputs:	**To:**
Data with Recognized Format	Review Data for Correct Format
Data with Non Recognizable Format	Check Documentation
Non Transcribed Data	Convert Media

Data Stores:	Access:
Data Standards	reads

3.1.4.6.1.2 Review Data for Correct Format - F-7.1.2

The Review Data for Correct Format function shall accept a data set in a recognizable format, mount the data set volumes, extract the format information, compare the given format with the data format standard, and check that the data set is in the correct format.

The Review Data for Correct Format function shall produce a summary output indicating the number of bytes contained in the data set, and the number of physical and logical records. It shall have the capability to produce a formatted dump of selected individual data records in hex/octal/ascii notation, and to list individual bytes or words as character strings or numeric values (integers and floating point) in standard formats used by VAX, PDP, or IBM computer systems.

Magnetic media data sets with physical read errors shall be checked using another read unit. If the errors are unrecoverable, the data sets shall be returned to the supplier for regeneration. The supplier shall be informed of the problems prior to the return of the data sets to ensure that the media type specifications are correct (tracks, density, etc.). Data sets with formats that do not conform to the standard format shall be sent to the convert data format function for further evaluation. Data sets with formats that conform to the standard shall be accepted and passed to the Check/ Sample Data Content (3.1.4.6.2) function. (Refer to Data Flow Diagrams: DFD-7.1)

Inputs:	From:
Data with Recognized Format	Evaluate Format
Data with Converted Type	Convert Data Type
Data Set with Corrected Format	Reformat to Standard
Outputs:	**To:**
Data Set with Format Error	Evaluate Correctability
Data Set with Agreed Format	Check Data Continuity
Data Set with Physical Error	PDS Data Suppliers
Data Stores:	**Access:**
Data Standards	reads

3.1.4.6.1.3 Check Documentation - F-7.1.3

The Check Documentation function shall accept a data set with a non-recognizable format and shall review the accompanying documentation to determine if the current format can be deciphered and read electronically. If a data set has inadequate format documentation, the supplier shall be notified and asked to supply the needed documents. If the documents are not received within 30 days, the package shall be rejected and returned to the supplier. If the data set is determined to be a candidate for correction, it shall be passed to the Evaluate Correctability (3.1.4.6.1.4) function. (Refer to Data Flow Diagrams: DFD-7.1)

Inputs:	**From:**
Data with Non Recognizable Format	Evaluate Format
Outputs:	**To:**
Data with Documentation for Reformat	Evaluate Correctability
Data with Undocumented Format	PDS Data Suppliers

3.1.4.6.1.4 Evaluate Correctability - F-7.1.4

The Evaluate Correctability function shall accept a data set with format errors and determine if it is cost effective to attempt to reformat the data set into the PDS standard format.

The data administrator and data preparation staff shall analyze the existing documentation and prepare a report itemizing the personnel and computer resources needed to perform the correction. This report shall be submitted to PDS management for review and decision. Rejected data sets shall be returned to the supplier with a copy of the report and the PDS management decision. Data sets which are accepted shall go to the appropriate convert function (media, data format, data type). (Refer to Data Flow Diagrams: DFD-7.1)

Inputs:	**From:**
Data with Documentation for Reformat	Check Documentation
Data Set with Format Error	Review Data for Correct Format
Outputs:	**To:**
Correctable Data Set	Reformat to Standard
Data with Incorrect Format	PDS Data Suppliers

3.1.4.6.1.5 Convert Media - F-7.1.5

The Convert Media function shall accept data sets which are not in machine readable format and shall convert them into a machine readable data set in the appropriate standard format.

The PDS shall support two forms of non-digital data entry:

1. Transcription of handwritten or typeset documentation to machine-readable text files.

2. Digitization of hard-copy resulting in a raster format image of the original data item.

The latter approach shall be used for data which cannot be conveniently converted to text or simple record formats of digital data values such as, plots, diagrams, and photographs.

The data preparation staff shall develop and utilize standard procedures for quality control in the conversion process. For transcribed text this shall include standard keypunch verification. For digitized material, the output shall be reviewed by the data preparation staff and also shall be provided to the supplier for review and acceptance. (Refer to Data Flow Diagrams: DFD-7.1)

Inputs:	**From:**
Non Transcribed Data	Evaluate Format
Outputs:	**To:**
Transcribed Data	Evaluate Format

3.1.4.6.1.6 Reformat to Standard - F-7.1.6

The Reformat to Standard function shall accept data sets with complex data format representations (hierarchical record structures or data dependent content requiring decommutation) and shall reformat the data set to the PDS data format standards.

It shall provide the capability for the conversion of record formats found on standard IBM mainframe, and PDP computer systems. It shall provide the capability to describe the input record structure to support the following reformatting and extraction operations:

1. Define header structures and record length variables (as found in variable length record formats).

2. Define repeating groups and nested repeating groups.

3. Output fixed format records containing values for data items defined in header or repeating group structures.

4. Replicate values found in header records or higher levels of a repeating structure in all output records.

5. Provide a printed summary of processing performed on input records, including counts of records processed and records output, and errors encountered in the conversion.

If a data set requires additional data type conversions, it shall be passed to the Convert Data Type (3.1.4.6.1.7) function for further processing. After a data set has been reformatted, it shall be returned for format evaluation. (Refer to Data Flow Diagrams: DFD-7.1)

Inputs:	**From:**
Correctable Data Set	Evaluate Correctability
Submitted Science Software	PDS Data Suppliers
Outputs:	**To:**
Data Set with Corrected Format	Review Data for Correct Format
Data for Type Conversion	Convert Data Type
Data Stores:	**Access:**
Data Standards	reads

3.1.4.6.1.7 Convert Data Type - F-7.1.7

The Convert Data Type function shall accept data sets containing data types which do not conform to the PDS data type standards (such as EBCDIC text, 36 bit integers, machine-dependent floating point) and shall convert the appropriate data items to the types required by the PDS data format standards. It shall operate on fixed format records produced by the Convert Media (3.1.4.6.1.5) function.

The Convert Data Type function shall provide the conversion of standard IBM mainframe, PDP, and VAX internal format representations to the PDS standard. It shall also provide a summary listing identifying the number of records processed and any error conditions encountered in the processing. (Refer to Data Flow Diagrams: DFD-7.1)

Inputs:	**From:**
Data for Type Conversion	Reformat to Standard

Outputs:	**To:**
Data with Converted Type	Review Data for Correct Format
Data Stores:	**Access:**
Data Standards	reads

3.1.4.6.2 Check/ Sample Data Content - F-7.2

The Check/ Sample Data Content function shall review data sets for content and quality. The Check Data Continuity (3.1.4.6.2.1) function shall determine if data is missing based on the description of the contents provided by the supplier. Next, this function shall check the data to determine if any parameters are out of range based on the parameter range definitions in the PDS data format standards and specifications provided by the supplier.

If the data set has a significant number of parameter values out of range, the data set shall be reviewed by the data preparation staff and the data supplier to determine the reason for the discrepancies. If the discrepancies cannot be resolved, the data set shall be rejected and returned. If the data set content is satisfactory and all discrepancies resolved, the data set shall be passed to the Check Data Continuity (3.1.4.6.2.1) function. (Refer to Data Flow Diagrams: DFD-7)

Inputs:	**From:**
Data Set with Agreed Format	Check Data Format
Outputs:	**To:**
Data Set with Good Content	Validate Software
Rejected Data with Content Error	PDS Data Suppliers

3.1.4.6.2.1 Check Data Continuity - F-7.2.1

The Check Data Continuity function shall accept a data set with an approved format and shall check for missing data based on the description of the data set contents.

Generally, missing data shall be identified based on time tags for records in the data set or a count of logical records provided by the data supplier. The Check Data Continuity function shall provide the capability to define data items on which continuity checks shall be performed and specify the nature of the checks (e.g., delta time from last record < 10 min). This function shall produce a listing summarizing the minimum and maximum values for checked parameters and the record location of any discrepancies found in the checks performed on the data.

If discontinuities have been identified, the data preparation staff shall contact the

supplier and attempt to resolve the discrepancy. If the discrepancy cannot be resolved, then the data set shall be passed to the Review by Experts (3.1.4.6.2.3) function. If the data set is continuous and matches its documentation, it shall be passed to the Check Parameter Range (3.1.4.6.2.2) function. (Refer to Data Flow Diagrams: DFD-7.2)

Inputs:	**From:**
Data Set with Agreed Format	Review Data for Correct Format
Outputs:	**To:**
Continuous Data	Check Parameter Range
Data Set with Missing Data	PDS Data Suppliers

3.1.4.6.2.2 Check Parameter Range - F-7.2.2

The Check Parameter Range function shall accept a data set, mount the data set, read the data set, and determine, where appropriate, if data set parameters are out of range based on the PDS data format standards and specifications provided by the supplier.

The Check Parameter Range function shall provide the capability to define parameters which should be checked and to specify limits for the parameters or to utilize default limits defined in the PDS data dictionary for the data type. It shall also allow for the specification of a maximum or minimum delta value from the last value encountered for a data item. This function shall provide a listing identifying the record location and data item name and value wherever a parameter range error is encountered, and shall summarize the maximum and minimum values encountered for all parameters checked.

If a data set has parameters which are out of range and the discrepancies cannot be resolved by the data preparation staff and data supplier, it shall be passed to the Review by Experts (3.1.4.6.2.3) function. If the data set does not have any parameters out of range, it shall be accepted and passed to the Review of Data by Peers (3.1.4.6.4) function. (Refer to Data Flow Diagrams: DFD-7.2)

Inputs:	**From:**
Continuous Data	Check Data Continuity
Outputs:	**To:**
Data Set with Data out of Range	Review by Experts
Data Set with Good Content	Evaluate Software Completeness
Data Stores:	**Access:**
Data Standards	reads

3.1.4.6.2.3 Review by Experts - F-7.2.3

The Review by Experts function shall accept a data set with missing data or with parameters out of range and shall arrange a review by a panel of experts in the appropriate science discipline. The panel shall review the data set and determine if the data set contents are useable despite errors in continuity or parameter values. If the panel rejects the data set contents, it shall be returned to the supplier with a report of the panel proceedings. If the data set is accepted, it shall be passed on to the Store Data (3.1.4.6.5) function. (Refer to Data Flow Diagrams: DFD-7.2)

Inputs:	**From:**
Data Set with Data out of Range	Check Parameter Range
Outputs:	**To:**
Data Set with Good Content	Evaluate Software Completeness
Data Content Rejected by Review	PDS Data Suppliers

3.1.4.6.3 Validate Software - F-7.3

The Validate Software function shall review any software submitted with a data set. The first step of this function shall be to determine if all the necessary software components have been included. The software components shall include but not be limited to source, relocatable, and executable elements, a link/locate map, a user guide, design documentation, and installation and test instructions. If the software package is incomplete, it shall be rejected and returned to the supplier.

Next, this function shall evaluate the software and documentation for quality to see if it meets the standards established in the PDS Software Management Plan and PDS Product Assurance Plan. It shall examine the source code to determine if the program performs its intended function and if the program and the documentation match. If the software and documentation are unsatisfactory, they shall be rejected and returned. Next the function shall evaluate the software to determine if regression can be performed, if the software should be converted to run in the PDS computing environment or other environments, and if the software should be included as one of the PDS official application programs. This function includes subfunctions to perform testing and software conversion. (Refer to Data Flow Diagrams: DFD-7)

Inputs:	**From:**
Data Set with Good Content	Check/ Sample Data Content
Submitted Science Software	PDS Data Suppliers

Outputs:	To:
Validated Unreviewed Data Set	Review of Data by Peers
Rejected Software	PDS Data Suppliers

3.1.4.6.3.1 Evaluate Software Completeness - F-7.3.1

This function shall accept a data set with the approved format and content and shall review the completeness of any submitted software. If a data set does not include any software, this shall be a null function. This function shall check for the presence of the source, relocatable element, executable element, link/locate map, user guide, design documentation, installation instructions, and test instructions. If the software package is incomplete, it shall be rejected and returned. Otherwise, the data set shall be passed to the next step. (Refer to Data Flow Diagrams: DFD-7.3)

Inputs:	From:
Data Set with Good Content	Check Parameter Range
Data Set with Good Content	Review by Experts
Submitted Science Software	PDS Data Suppliers

Outputs:	To:
Data Set with Complete Software	Evaluate Software Quality
Rejected Software	PDS Data Suppliers

3.1.4.6.3.2 Evaluate Software Quality - F-7.3.2

The Evaluate Software Quality function shall accept a data set which has been checked for software completeness and shall check the software and documentation for quality.

The source code shall be examined to determine if the program performs its intended function and if the program and the documentation match. If the source code cannot be easily interpreted or if discrepancies between the source code and documentation are found, then the software package shall be rejected and returned to the supplier. Otherwise, the data set shall be passed to the next step. (Refer to Data Flow Diagrams: DFD-7.3)

Inputs:	From:
Data Set with Complete Software	Evaluate Software Completeness

Outputs:	To:
Data Set with Quality Software	Administer Software Evaluation
Rejected Software	PDS Data Suppliers
Data Stores:	**Access:**
Software Standards	reads

3.1.4.6.3.3 Administer Software Evaluation - F-7.3.3

The Administer Software Evaluation function shall accept a data set with quality software and shall evaluate if regression testing can be performed, and if the software should be converted to run in the PDS computing environment as one of the PDS official application programs. This function includes subfunctions to perform software testing and software conversion.

The data preparation staff shall administer the evaluation and also make recommendations to the PDS Project Manager for special conversion requirements. Based on the decision of the PDS Project Manager the appropriate resources shall be allocated and scheduled for conversion by the PDS staff, or the task shall be contracted to the software supplier. (Refer to Data Flow Diagrams: DFD-7.3)

Inputs:	From:
Data Set with Quality Software	Evaluate Software Quality
Test Results and Data Set Software	Test Science Data Software
Converted Data Set Software	Convert Science Data Software
Outputs:	**To:**
Data Set Software for Testing	Test Science Data Software
Data Set Software for Conversion	Convert Science Data Software
Validated Unreviewed Data Set	Schedule Review

3.1.4.6.3.4 Test Science Data Software - F-7.3.4

The Test Science Data Software function shall accept the software component of a data set and perform regression testing and other testing to determine if an application program or system performs to specification without errors. If an application does not perform to specification, it shall be rejected and returned to the supplier.

The testing to be performed shall include an evaluation of the interaction between the software and the user (user interface), evaluation of error recovery procedures (graceful exit with diagnostics), display of processing status information and the production of anticipated program outputs (displays, printouts, data files or products).

The user interface shall conform to PDS software standards, as specified in the PDS Product Assurance Plan in both menu-driven and command-driven modes. Error recovery procedures shall be tested for invalid user command input and invalid data input to judge potential problems in the handling of these situations. Processing status displays shall be evaluated for the utility of displayed information, compatibility with PDS status display standards and accuracy of the display content. Program outputs shall be evaluated by comparison with samples provided in the data package submitted to PDS, by verification of a sampling of outputs values based on a review of program documentation and stated functionality or by enlisting assistance of experts in the discipline to participate in portions of the testing procedure.

The data preparation staff shall maintain a detailed log of all test activities. The configuration of the computer system during testing shall be noted as well as the exact conditions under which discrepancies or program failures were encountered. Program runstreams, logs of program messages and system dumps shall be produced for all unsuccessful test runs. (Refer to Data Flow Diagrams: DFD-7.3)

Inputs:	**From:**
Data Set Software for Testing	Administer Software Evaluation
Outputs:	**To:**
Test Results and Data Set Software	Administer Software Evaluation

3.1.4.6.3.5 Convert Science Data Software - F-7.3.5

The Convert Science Data Software function shall accept the software component of a data set and convert the application to run in the PDS computing environment or to a high level programming language. This function shall be invoked when the general utility of a submitted software component makes it desirable to include it as a standard processing function.

Inclusion of software modules in the PDS computing environment shall involve preparation or conversion of necessary documentation or help files for entry in the executive structure, modification of software to be consistent with executive parameter handling procedures and modification of software display and output functions to be consistent with PDS executive procedures. It also includes the conversion of software to conform to PDS software standards, including internal documentation, control flow and utilization of hardware or system dependent functions. (Refer to Data Flow Diagrams: DFD-7.3)

Inputs:	**From:**
Data Set Software for Conversion	Administer Software Evaluation

Outputs:	**To:**
Converted Data Set Software	Administer Software Evaluation
Data Stores:	**Access:**
Software Standards	reads

3.1.4.6.4 Review of Data by Peers - F-7.4

The Review of Data by Peers function shall be the last step in the validation of a data set. At this point, the data set shall be ready for inclusio into the PDS. First, this function shall schedule a review, distribute review materials, conduct the review, and finally evaluate the results of the review. If a data set is deemed unsatisfactory, it shall be rejected and returned to the supplier with an explanation. Otherwise, the data set shall be sent to the Store Data (3.1.4.6.5) function. (Refer to Data Flow Diagrams: DFD-7)

Inputs:	**From:**
Validated Unreviewed Data Set	Validate Software
Outputs:	**To:**
Validated Data Set	Store Data
Rejected Data Set with Explanation	PDS Data Suppliers

3.1.4.6.4.1 Schedule Review - F-7.4.1

This function shall accept a validated data set and shall schedule a review by peers for the final evaluation of the data set before its inclusion in the PDS. The data administrator shall select a review committee, the review forum, a date for the review, and a final completion date.

Normally, the review committee shall consist of standing committees for major planetary disciplines. Review forums shall normally be scheduled to coincide with regularly scheduled PDS meetings. (Refer to Data Flow Diagrams: DFD-7.4)

Inputs:	**From:**
Validated Unreviewed Data Set	Administer Software Evaluation
Outputs:	**To:**
Review Schedule	Prepare and Distribute Review Materials
Review Schedule	Conduct Review

3.1.4.6.4.2 Prepare and Distribute Review Materials - F-7.4.2

The Prepare and Distribute Review Materials function shall accept a validated data set, prepare the material which will be used at the peer review, and distribute the material prior to the scheduled review. The material shall be sent at least two weeks prior to the review.

Review material shall consist of the data preparation agreement (MOU (B.89)), data set documentation and data preparation reports submitted by the preparer, the results of PDS data set validation and software validation activities and samples of data set analysis products submitted with the data package. (Refer to Data Flow Diagrams: DFD-7.4)

Inputs:	**From:**
Review Schedule	Schedule Review
Outputs:	**To:**
Review Materials	Conduct Review
Data Stores:	**Access:**
Data Sets Under Review	writes

3.1.4.6.4.3 Conduct Review - F-7.4.3

The Conduct Review function shall accept the validated data set and the review schedule and shall conduct the review on schedule in the appropriate forum. The review shall be conducted in a manner consistent with current peer review practices for consideration of science analysis proposals.

The review board shall consider the data set format, content, documentation, ancillary data, and software and provide a written summary of all deliberations and conclusions. Each logical component of the data set shall be judged separately for inclusion or rejection, and a clear indication of the cause of rejection shall be provided. Whenever possible, the explicit steps which must be taken by the supplier to correct faults shall be enumerated.

The review board shall also make recommendations regarding the disposition of accepted data sets. These recommendations shall include a determination of the appropriate data processing level and quality tags to be assigned, its position in the data hierarchy (on line, off line, etc), the number of inventory copies, which components shall enter the PDS archive, and other recommendations to the data administator. In addition, some data sets may be selected for immediate distribution to predefined "standing" distribution lists. (Refer to Data Flow Diagrams: DFD-7.4)

Inputs:	**From:**
Review Schedule	Schedule Review
Review Materials	Prepare and Distribute Review Materials
Outputs:	**To:**
Review Results	Evaluate Review Results
Data Stores:	**Access:**
Data Sets Under Review	reads

3.1.4.6.4.4 Evaluate Review Results - F-7.4.4

The Evaluate Review Results function shall be performed by the PDS data administrator. This function shall accept the validated data set and the review results and shall determine the actions to be taken to fulfill the recommendations of the review board. It shall also resolve any conflicts between the recommendations of the review board and the capabilities of the PDS. Conflicts shall be resolved by mutual agreement of the Data Administrator, the PDS Project Manager, the PDS Project Scientist and the review board chairman. If the data set is rejected, it shall be returned to the supplier with the report of the review board. (Refer to Data Flow Diagrams: DFD-7.4)

Inputs:	**From:**
Review Results	Conduct Review
Outputs:	**To:**
Validated Data Set	Extract Data
Rejected Data Set with Explanation	PDS Data Suppliers
Data Stores:	**Access:**
Data Sets Under Review	reads

3.1.4.6.5 Store Data - F-7.5

The Store Data function shall accept validated data sets and shall incorporate them in the PDS data storage system (see Taxonomy of PDS data, SSD 0 (A.31)). All validated science data and selected support data shall also become part of the PDS archive. All validated data sets shall become part of the PDS operational storage system.

The PDS archive shall be the permanent repository of all validated planetary science data. Support data shall also be included in the archive at the direction of the data review board. The PDS shall assure that the archive is properly maintained (see Maintain Archive (3.1.4.5.4.2)).

PDS operational data shall include all science and support data (including software and documentation) and shall be further divided into DBMS Controlled (B.24) data, Non DBMS Controlled (B.98) data, and a Non DBMS Controlled (B.98). The PDS data storage architecture shall include both on line (disk) and off line (tape) storage at the central node and at the discipline nodes. For certain data sets (e.g., planetary images), only specific subsets shall be stored actually under the cognizance of PDS for Version 1.0, due to the massive volume of the total data sets.

Categories of data within the DBMS controlled subset include system support data, (information required to operate the PDS) and reference data, (information to be provided to PDS users). The store data function shall provide DBMS reference data through the Extract Data (3.1.4.6.5.1) and Prepare Data (3.1.4.6) functions. The storage architecture (file organization and naming conventions) shall be handled internal to the data management system.

Working Data Sets shall be used by other PDS functions but are not addressed by the Store Data (3.1.4.6.5) function.

Non DBMS Controlled (B.98) shall consist of Operational Local Archive (B.106) and On Line Non DBMS Data (B.105). The distribution inventory shall contain individual or multiple copies of data sets organized in orderable units which can be provided with minimal intervention or processing by the PDS staff. The operational local archive shall consists of off line storage on tape, optical disc or magnetic disk, the distribution inventory of data set copies of distribution, and non-machine readable products.

Each component of the distribution inventory and non-DBMS controlled data shall be identified by a unique name. For digital data sets this name shall normally consist of a volume name, directory name, one or more subdirectory names, and a file name. For off line digital data sets stored on magnetic tape, the name shall include the tape reel identifier and the file number containing the data set, unless this information is available to the operating system as part of the data set attributes. The naming conventions for all non-DBMS controlled PDS data sets shall be determined by the PDS Data Administrator.

The Store Data function shall determine which components of a validated data package should be used to update the various PDS data stores. In addition, it shall provide the capability to extract or subset data sets to produce special files which shall be passed to the individual update functions. In general, documentation files and subsets or extracted science data shall be used to update the PDS high-level catalog. The entire data set, or a selected subset shall be used to update the low-level catalog for the specific discipline. Other components of the data package shall be used to update the PDS archive, and operational data stores including the science data, software, and ancillary data.

All media used for data storage shall be certified to be error free prior to being used for data storage. This function shall assure that the media used for data storage has an anticipated shelf/usage life of greater than 10 years. (Refer to Data Flow Diagrams: DFD-7)

Inputs:	From:
Request to Stage Data	Retrieve Inspect Data
Validated Data Set	Review of Data by Peers
Request to Stage Data	Retrieve Ordered Data
Outputs:	**To:**
Catalog Data for Update	NSSDC
Data Stores:	**Access:**
Operational Planetary Data	reads
Operational Planetary Data	writes
Planetary Data Archive	writes

3.1.4.6.5.1 Extract Data - F-7.5.1

This function shall accept an approved data set and shall extract the data components which shall update the catalog data, sample and summary data, the PDS data hierarchy, the software library, and the ancillary data.

For PDS Version 1.0, this shall primarily be a manual function performed by the PDS data management staff. The extract data function shall provide for the selection and direction of a subset of a validated data package for direct input to the appropriate update storage function.

It shall also provide the capability to select and extract a subset of data element values from a record structure and to select sample/summary records based on values for the data elements (e.g., select if delta from last value is greater than n), or based on a simple count of data records (e.g., select every 5th record). This function shall be able to produce one or more files of extracted data formatted for direct entry into the PDS data management system, and also shall provide a summary identifying the elements contained in each extract file and the format of each element. (Refer to Data Flow Diagrams: DFD-7.5)

Inputs:	From:
Validated Data Set	Evaluate Review Results
Outputs:	**To:**
Extracted Catalog Data	Prepare Catalog Data
Extracted Sample/Summary Data	Prepare Sample/ Summary Data
Extracted Science Data	Prepare Science Data
Extracted Software	Prepare Software Library
Extracted Ancillary Data	Prepare Ancillary Data

3.1.4.6.5.2 Prepare Catalog Data - F-7.5.2

The Prepare Catalog Data function shall accept and validate the extracted catalog data files against the operational catalog. The function shall then prepare load routines to update the elements of the catalog to indicate the availability of new data files, software or ancillary data. All catalog data shall be stored in the Operational Planetary Data (B.107) under DBMS control. This function shall be performed using utility routines of the database management system. The DBA staff shall provide the necessary load routines to the Service Data Storage Requests (3.1.4.6.5.7) to execute the update.

All updates shall be documented, including the time and date of the update, identification of the catalog table(s) being updated, the identity of the update file(s), an indication of any errors which occurred during the update process and a summary of the status of the catalog after the update to be used to verify success of the update activity. Whenever possible, the supplier of the new data sets shall be notified and requested to access the updated tables to verify that the submitted information has been accurately reflected in the updated catalog.

This function shall generate a catalog update log which shall be delivered to the data administrator and shall provide a notice of the update to affected users via the mail system. (Refer to Data Flow Diagrams: DFD-7.5)

Inputs:	**From:**
Extracted Catalog Data	Extract Data
Outputs:	**To:**
Catalog Data for Update	Service Data Storage Requests
Catalog Data for Update	NSSDC

3.1.4.6.5.3 Prepare Sample/ Summary Data - F-7.5.3

The Prepare Sample/ Summary Data function shall accept files of extracted sample or summary data, assign an appropriate data set name and add the file(s) at the appropriate position in the PDS storage hierarchy, and updated all relevant catalog entries which reference the sample/summary file. A PDS mail message shall be forwarded to all members of the appropriate discipline indicating the availability of the new data. (Refer to Data Flow Diagrams: DFD-7.5)

Inputs:	**From:**
Extracted Sample/Summary Data	Extract Data

Outputs:	To:
Sample/Summary Data for Update	Service Data Storage Requests

3.1.4.6.5.4 Prepare Science Data - F-7.5.4

This function shall accept the extracted data component, update the science data in the data hierarchy, remove references to earlier versions, provide the date of the update, and provide a description of changes from the last version.

A PDS mail message shall be forwarded to all members of the appropriate discipline indicating the availability of the new data. (Refer to Data Flow Diagrams: DFD-7.5)

Inputs:	From:
Extracted Science Data	Extract Data
Outputs:	**To:**
Science Data for Update	Service Data Storage Requests

3.1.4.6.5.5 Prepare Software Library - F-7.5.5

This function shall accept the source and executable modules and the documentation for software from a validated data package and shall update the PDS software library. For new software, a version number shall be provided by the data administrator and incorporated in the software identification. The PDS catalog shall also be updated with extracted documentation to identify the new software modules.

If the software is an update to an existing software module, then a new version number shall be assigned and incorporated in the software identification by the data administrator to identify the changes. In addition, a software update notice describing the changes and implications of those changes shall be forwarded via PDS mail to all users of that software component and added to the documentation file for the software. All additions and revisions shall be performed in accordance with the PDS Configuration Management Plan. (Refer to Data Flow Diagrams: DFD-7.5)

Inputs:	From:
Extracted Software	Extract Data

Outputs:	To:
Software Data for Update	Service Data Storage Requests

3.1.4.6.5.6 Prepare Ancillary Data - F-7.5.6

This function shall accept and validate the extracted ancillary data, determine how the data should be stored, and develop any load routines required to bring the data on line using the DBMS load utilities and VMS utilities. Ancillary data shall include any supporting data or information that is important for viewing or interpreting a data set (i.e. navigation pointing, spacecraft trajectory, sequence of events, calibration files, instrument documentation and/or diagrams). The DA staff performing the Acquire Data (3.1.4.5.4.6) function shall have already determined where in the PDS Global Data Model this data should be stored (i.e. in the catalog, as a data set in the Permanent Science Data (B.121), or in the documentation library) and develop any necessary schema to store this data. (Refer to Data Flow Diagrams: DFD-7.5)

Inputs:	From:
Extracted Ancillary Data	Extract Data
Outputs:	**To:**
Ancillary Data for Update	Service Data Storage Requests

3.1.4.6.5.7 Service Data Storage Requests - F-7.5.7

The Service Data Storage Requests function shall accept orders for updating the storage hierarchy and shall store the catalog data, sample/summary data, science data, ancillary data, and software and software documentation in the appropriate storage location.

The storage hierarchy is composed of the Planetary Data Archive, the Operational PDS Local Archive, and the On Line Operational Planetary Data. The Planetary Data Archive (B.122) shall be composed of a master copy of all planetary science data sets that are stored in a deep archive. This archive shall be added to, but nothing shall be deleted from it. The Operational Local Archive (B.106) shall be composed of a working (second) copy of each o the supported digital data sets for off line storage, the Distribution Inventory that includes extra copies of various data sets for distribution, and non-machine readable data products that PDS distributes (i.e. pictures, negatives, plots). The On line Operational Planetary Data shall include various types of on line data, either stored under DBMS control or in non-DBMS controlled (VMS) files.

The Operational PDS Local Archive shall be updated by deleting earlier versions of the data files if the new data is an update, or by storing multiple copies with unique names or version numbers if the update is an alternate version of the data set. The On Line Operational Planetary Data shall always store the most current version of the data

set unless the discipline node scientists determine another version to be more critical or more widely accepted.

The Service Data Storage Requests function shall store all catalog data in the On Line Operational Planetary Data under DBMS control. The function shall also store all sample/summary data and ancillary data in the On Line Operational Planetary Data under DBMS control, where possible. Those sample data sets and ancillary data that do not lend themselves to being stored in a relational structure shall be stored on line in non-DBMS controlled files, if they have predefined access and manipulation routines. The software shall be stored by the function in the Operational Planetary Data (B.107) in non-DBMS controlled (VMS) files on line, if possible. This function shall store the critical science data sets in the On Line Operational Planetary Data according to the priorities defined in the Maintain Storage Hierarchy (3.1.4.5.4.1) function as long as the storage capacity is available. As with the sample data sets, all science data sets stored on line shall be stored under DBMS control, where possible. Those data sets that are lower on the priority list shall be stored off line in Operational Local Archive (B.106) storage, but shall be brought on line when requested by a user in a Data Stage Order (B.47).

The Service Data Storage Requests function shall prepare a data package to go to the deep archive facility, including a request for archive storage, a complete set of machine-readable documentation and a full complement of digital data sets to be added to the archive. The request shall identify whether this is a new submission or an update of an existing archived data set. (Refer to Data Flow Diagrams: DFD-7.5)

Inputs:	**From:**
Catalog Data for Update	Prepare Catalog Data
Sample/Summary Data for Update	Prepare Sample/ Summary Data
Science Data for Update	Prepare Science Data
Software Data for Update	Prepare Software Library
Ancillary Data for Update	Prepare Ancillary Data
Data Stage Order	Service Data Staging Requests

Outputs:	**To:**
None	

Data Stores:	**Access:**
DBMS Reference Data	reads
On Line Non DBMS Data	reads
Planetary Data Archive	writes
DBMS Reference Data	writes
On Line Non DBMS Data	writes

3.1.4.6.5.8 Service Data Staging Requests - F-7.5.8

The Service Data Staging Requests function shall accept requests to stage data, evaluate the most efficient and cost effective means to stage the data, and issue an order to stage data. Normal staging requests shall involve temporarily relocating or duplicating data in on line storage, most often under DBMS control or occassionally in VMS files where necessary.

Staging shall be required for data sets which utilize off line storage (magnetic tape, optical disc). The staging request shall be provided to the operations staff, as a result of either the inspect data or order data functions.

The staging function shall provide the capability to transfer either an entire volume, data package of related files or selected individual data files from one media or storage device to another. The staging function shall store the data utilizing the standard data set schemas developed during the initial installation of the data set in the PDS. The primary mode shall be to store the data in the DBMS so that the user shall be able to utilize the full retrieve, manipulate, and display capabilities of the Inspect Data (3.1.4.2) function to view the staged data. Selected data sets whose structure do not lend itself to being stored in the relational model (i.e., image data) shall be stored in VMS files with predefined access and manipulation routines. Those data sets that do not fall into the two categories listed above shall not be able to be staged to on line storage. The user shall only be able to order this data using PDS. The data may then be viewed at the user's home institution. (Refer to Data Flow Diagrams: DFD-7.5)

Inputs:	**From:**
Request to Stage Data	Interpret Retrieve Command
Request to Stage Data	Interpret Order Retrieve Command
Outputs:	**To:**
Data Stage Order	Service Data Storage Requests

3.1.5 Configuration Allocation

The PDS shall be developed around preexisting hardware and software components. The use of these items has been established as a requirement for technical and historical reasons identified during the PPDS Prototype Development. The sections that follow identify these components and define the major configuration items (both Hardware Configuration Items (HWCI) and Computer Software Configuration Items (CSCI)) that shall form the PDS.

3.1.5.1 PDS Central Site Computer HWCI

The PDS central node hardware system shall consist of a Digital Equipment Corporation (DEC) VAX 11/780 computer system. The system shall be equipped with the following hardware:

1. 16 Megabytes of main memory
2. 1,000 Megabytes on line disk storage
3. Tri-density Magnetic tape drive
4. High Speed Printer (600 LPM)
5. Communications equipment to interface to the SPAN and to a minimum of 32 local and remote asynchronous terminal users and/or interfaces.
6. Two VT100 terminals located in the user support area.
7. One CALCOMP 1051 per plotter with 907 controller located in the user data area.

This hardware shall execute all functions of PDS Version 1.0 except those reserved for the the Britton Lee database machine and for the Communications Network configuration items.

3.1.5.2 Central Site Britton-Lee Database Machine HWCI

Data management functions within the PDS shall be performed by the Britton Lee 500/X Intelligent Data Base Machine (IDM). This hardware shall be equipped as follows:

1. Data Base Processor
2. 2 Megabytes Main Memory
3. 600 Megabytes Disk Storage
4. Cartridge Tape for Backup
5. Ethernet Interface with VAX Host Computer

The Central Site Britton-Lee Database Machine HWCI shall perform all science data and catalog storage and retrieval functions outlined in the functional requirements portion of this specification. In addition, PDS operational data management functions may be implemented on the Britton Lee as well.

3.1.5.3 Communications Network HWCI

The PDS shall be able to communicate with the distributed discipline and data nodes as well as with its widely distributed users. Internodal communication shall utilize the Space Physics Analysis Network (SPAN) which is a DECnet based network connecting various VAX computers within the space science community. Communication with individual users shall be via asynchronous connections with local and remote terminals. The PDS shall support connections via the public dialed network, the Telenet network, and virtual linkages from host computers on the SPAN.

The Communication network shall perform all interconnection functions described in the Access System (3.1.4.1). The central node PDS shall support up to 32 asynchronous connections for users and local software development. When operational, the PDS shall support the concurrent access of up to eight (8) remote users.

3.1.5.4 Discipline Node HWCI

This section contains a description of the hardware configuration items (HWCI) at the Discipline Nodes. The PDS is a distributed system with total functionality distributed among the Central Node at JPL and multiple discipline and data nodes. In PDS Version 1.0, the central node shall operate independent from the discipline and data nodes. However, as the discipline nodes develop operational capabilities, they shall become integrated into the functionality provided by the central node.

No standards have been established for the hardware at each of the discipline nodes for Version 1.0. However, in Version 1.0 only DEC VAX systems connected to the SPAN shall be able to be integrated into the PDS.

3.1.5.5 Central Node CSCI

There shall be a requirement for the PDS to make maximum use of existing programming and off the shelf packages. To this end, the software design and the requirements shall adapt to available software. The central node software for Version 1.0 shall be a combination of project developed application code, node developed application code, and commercially developed system and application software. The following packages have been proposed as candidates for PDS Version 1.0 software:

1. VAX-VMS Operating System. Most likely, the PDS VAX host computer will use the VAX operating system.

2. Transportable Application Interface (TAE). Most likely, the highest level user interface to the PDS will be provided by the NASA developed TAE.

3. Freeform. Most likely, the high level menu interface to the Britton Lee data base machine will be provided by the Freeform package developed by Dimension Software Inc.

4. Graphics IDL. Most likely, a graphics presentation and scientific analysis capability will be provided be the IDL package.

5. Compilers. The PDS project shall standardize on the Fortran and "C" languages for application program development.

The central node will also have a considerable body of application program development. This software shall satisfy the requirements stated in Requirements (3). The application software will be divided into the following major subsystems:

1. Access System (3.1.4.1)

2. Inspect Data (3.1.4.2)

3. Order Data (3.1.4.3)

4. Distribute Data (3.1.4.4)

5. Administer System (3.1.4.5)

6. Prepare Data (3.1.4.6)

3.1.5.6 Britton Lee CSCI

The Britton Lee database machine shall be equipped with the standard IDM resident relational DBMS software. In addition, the VAX-VMS H-A-51 host software shall operate on the VAX host computer. An Ethernet driver shall provide software connectability. Most likely, the Freeform package (mentioned in Central Node CSCI (3.1.5.5) will provide the high level menu interface.

3.1.5.7 Discipline Node CSCI

All discipline-unique node software shall be developed by node personnel. The exact capabilities of this software shall be determined in the design. All central node application software shall be available for installation at the discipline nodes.

3.1.5.8 PDS User CSCI

The software required for those PDS users who are not located at discipline nodes has not yet been determined.

3.1.6 Interface Requirements

Interfaces to PDS exist for the following purposes:

1. To provide access to the user access function (access)

2. To provide data to the user from PDS (PDS output)

3. To provide data to PDS from data sources (data nodes, discipline nodes, etc.) (PDS input)

The following interfaces to PDS shall exist for the listed purposes:

Interface	Provides (function)
SPAN	access, PDS output, PDS input
ILAN	access, PDS output, PDS input
TELENET	access
DIRECT	access, PDS output, PDS input
MODEM	access, PDS output
TAPE TRANSPORT	PDS output, PDS input
CDROM	PDS output
VAX/Britton Lee	PDS output, PDS input

3.1.6.1 External Interfaces

The PDS has a large number of external interfaces. The interfaces are grouped according to the types of inputs they generate for and outputs they receive from the PDS. The two types of interfaces are: 1) PDS Users who access the catalog, browse, and request planetary science data, and 2) PDS Data Suppliers.

3.1.6.1.1 PDS Data Suppliers - I-2

Certain PDS Nodes supply data for the Operational Planetary Data (B.107). These data nodes are described in the following sections. (Refer to Data Flow Diagrams: CSD-0, DFD-7.1, DFD-7, DFD-7.2, DFD-0, DFD-7.3, DFD-7.4, DFD-6.4)

Inputs:	From:
Data with Undocumented Format	Check Documentation
Data with Incorrect Format	Evaluate Correctability
Data Set with Physical Error	Review Data for Correct Format
Rejected Data with Format Error	Check Data Format
Rejected Data with Content Error	Check/ Sample Data Content
Rejected Software	Validate Software
Data Set with Missing Data	Check Data Continuity
Data Content Rejected by Review	Review by Experts
Rejected Data and Software	Prepare Data

Rejected Software	Evaluate Software Completeness
Rejected Software	Evaluate Software Quality
Solicitation for Software to Include	Acquire System Software
Software Standards for Submission	Acquire System Software
MOU	Acquire System Software
Rejected Data Set with Explanation	Review of Data by Peers
Rejected Data Set with Explanation	Evaluate Review Results
Rejected Data and Software	Planetary Data System
Data and Software Agreement from System	Planetary Data System
Data and Software Agreement from System	Administer System
Solicitation for Data to Include	Database Administration
MOU	Database Administration
Solicitation for Software to Include	Database Administration
Software Standards for Submission	Database Administration
Data Standards for Submission	Database Administration
Solicitation for Data to Include	Acquire Data
MOU	Acquire Data
Data Standards for Submission	Acquire Data

Outputs:	**To:**
Data and Software Agreement from Supplier	Planetary Data System
Submitted Science Data and Software	Planetary Data System
Data and Software Agreement from Supplier	Administer System
Solicitation for Data to Include	Database Administration
Solicitation to Include Software	Database Administration
Software Standards for Submission	Database Administration
Data Standards for Submission	Database Administration
MOU	Database Administration
Solicitation for Software to Include	Database Administration
Solicitation to Include Data	Acquire Data
Solicitation to Include Software	Acquire System Software
Submitted Science Data and Software	Prepare Data
Submitted Science Data	Check Data Format
Submitted Science Data	Evaluate Format
Submitted Science Software	Validate Software
Submitted Science Software	Reformat to Standard

3.1.6.1.1.1 PDS Nodes/Constituents - No Synonyms

The group of external interfaces which are PDS Nodes and Constituents are all sources of planetary science data for the PDS.

3.1.6.1.1.1.1 Discipline Nodes - DDMU,Discipline-Data-Mgmt-Unit

The discipline node is a data management unit which is based on the characteristics of the Discipline Data Management Unit (DDMU) defined in <1>. The DDMU has a broader scope than either the Principle Investigator or Project Data Management Units. A DDMU has the following characteristics.

1. The DDMU employs archive scientists as well as technical and administrative support staff.

2. The DDMU provides the interface between investigators in a scientific discipline and the NASA data collection process.

3. The DDMU archives and distributes data relevant to its discipline.

4. The DDMU provides scientific oversight for data processing when required.

5. The DDMU exercises scientific oversight of any data purging and is prepared, if necessary, to "rescue" selected data for scientific use.

6. The DDMU provides coordination among disciplines in support of interdisciplinary analysis efforts.

7. The DDMU develops software for general use in a discipline and coordinates software development with other data management units and with the user community.

8. The DDMU assumes a leadership role in developing software and data standards and formats.

9. The DDMU provides computation facilities for investigators who desire to use the data in the DDMU archives but who do not possess their own dedicated computational facilities.

10. The DDMU advises the user community of the availability of relevant data and assists the user community in obtaining access to these data.

11. In some cases, the DDMU operates the principal archives for its discipline.

12. In some cases, the DDMU creates specialized databases for general disciplinary use.

13. In some cases, the DDMU creates and maintains models representing the data in its discipline.

14. The DDMU is responsive to advice from a committee of active investigators in its discipline - a user committee.

15. The activities of the DDMU are periodically reviewed by an oversight committee.

16. The DDMU, its users committee, and its advisory committee are jointly responsible for advising NASA on the scientific requirements for data collection, processing, archival, distribution, and analysis.

A DDMU will be provided with sufficient continuity to perform its functions. However, being a DDMU will not be a "permanent" commitment. There will be procedures for terminating a DDMU as well as establishing one. A DDMU will be established for a prescribed period of three to five years. At the end of this period a formal review of the unit will be carried out to determine whether it should be continued, discontinued, or revised.

Each discipline must take the responsibility for tailoring the DDMU concept to its specific requirements and determining those areas within the discipline for which it is appropriate.

The above description was excerpted from "Data Management and Computation, Volume 1," CODMAC. See reference <1> in Applicable Documents (2).

3.1.6.1.1.1.1.1 Atmospheres Node - No Synonyms

The Atmospheres Testbed, located at the Laboratory for Atmospheric and Space Physics (LASP) of the University of Colorado, shall act as an aeronomy data testbed concentrating on Mars. The science objectives driving this effort will address the question of water in the Martian troposphere. An outstanding problem concerns the transport of water vapor between the polar caps and the mid-latitudes reservoir in the regolith by baroclinic waves in spring and summer; the concomitant effects on the photochemistry of ozone and the recombination of carbon dioxide; the interaction between these processes and the aerosol burden (both dust and ice crystals); and the thermal effects of all these phenomena. These problems shall be addressed by quantifying the occurrence of baroclinic waves using Viking MAWD data and Viking Lander data, and by predicting the associated effects on tropospheric ozone aerosol burdens. Based on this work, an investigation of the baroclinic waves in Mariner 9 UVS ozone data and TV images shall be made, and computer models shall be applied to the problem of reproducing baroclinic wave signatures in these and other data sets, and producing a detailed model of the photochemical, thermal, aerosol, and water transport properties of these waves. These activities will require a significant DBMS capability, leading the PDS to select this testbed as a node for a Britton-Lee database machine. In effect, the Atmospheres Testbed is a prototype discipline/data node.

3.1.6.1.1.1.1.2 Fields and Particles Node - No Synonyms

The Fields and Particles (F & P) Testbed activity will be coordinated by UCLA. Other involvement includes Applied Physics Laboratory, Johns Hopkins University: the University of Iowa: and MIT. Many of the fundamental plasma physics problems which have to be solved to obtain a basic understanding of the dynamics of planetary magnetospheres require the use of multiparameter data sets consisting of the particle and field measurements appropriate for the problem. The purpose of the F & P activity shall be to provide a combined data set of fields and particles data to study in detail the plasma processes operating in Jupiter's environment. Examples of such processes which play important roles in shaping the various physical regions of the Jovian magnetosphere are particle heating acceleration, magnetic field line reconnection, generation of plasma structures, generation of plasma turbulence, and energy balance between magnetic fields and particle populations. Examples of regions within the Jovian environment where detailed scientific studies shall be performed are the magnetopause, the I torus, the magnetodisc, and the planetary wind. A significant DBMS capability is required. Thus, UCLA was chosen to be the third site for Britton-Lee database machine. In effect, this testbed acts as a prototype discipline/data node or center.

3.1.6.1.1.1.1.3 Infrared Radiometry Node - No Synonyms

The Infrared (IR) Radiometry Testbed involves the use of the XG system. The XG software system was originally developed at UCLA and then improved under PDS funding at the USGS, Flagstaff. XG provides a capability to search, sort, and access radiometry data, including Viking IRTM and MAWD data sets. The IR Radiometry Testbed at the USGS, Flagstaff, thus acts as prototype discipline data node in the PDS.

3.1.6.1.1.1.1.4 Navigation Ancillary Information Facility - NAIF

NAIF is not a typical PDS user. NAIF will only be a user when supplying or maintaining navigation data in the catalog, in the browse/sample data, or the actual navigation data. NAIF will presumably receive feedback either from the nodes or the DBA on data errors, quality, etc.

3.1.6.1.1.1.1.5 Planetary Rings Node - No Synonyms

There is currently signficant interest in planetary rings. The existence of the PDS will most likely facilitate the bringing together of geographically distributed scientists to study different data sets focusing on this topic of high current interest. There are at least four significant spacecraft data sets that are sufficiently recent in acquisition that are reasonably well known, and knowledgeable investigators still exist who can help document the data and its attributes. The Rings Testbed at JPL is designed to bring the expertise and data together.

This research shall focus on studying several questions concerning the detailed

structure and dynamics of the planetary rings. In particular the Testbed's objective will be to extend the present analysis work to even finer scales of structure by careful comparisons of small scale features found in each of the data sets. Studies of ring particle size distributions, density wave dynamics, and satellite-ring particle resonance interactions will be conducted and models of ring formation and behavior will be generated.

Because of the size of data sets regarding planetary rings and their recent acquisition, it may be possible to capture all planetary ring data into the PDS. There is also the possibility of acquiring data from the Voyager Uranus encounter. This will allow the PDS to develop and test methods for handling data from ongoing missions. In effect, the Rings Testbed acts as a relatively small-scale discipline node or Center.

3.1.6.1.1.1.1.6 RPIF Node - No Synonyms

The Regional Planetary Image Facilities (RPIFs) consist of ten geographically distributed browse libraries for planetary image and ancillary data, supported by NASA's Planetary Geology and Geophysics Programs. The RPIFs in aggregate form a distributed discipline data center, although except for USGS and JPL they do not distribute data on a regular basis. Within the existing PDS science testbeds, the Jet Propulsion Laboratory; the USGS, Flagstaff; and Washington University each house an RPIF. To exercise this RPIF testbed, various responsibilities shall be assigned to each of these organizations i ways that reflect the probable distribution of tasks that would be allotted when the RPIFs are brought into the PDS as an operational discipline node or center. The allotment of tasks shall be based on the expertise available at each of the three RPIF testbed nodes.

The Jet Propulsion Laboratory shall be responsible for ensuring that mission image and ancillary data are properly transferred to the RPIFs. These activities include acquisition and delivery of SEDR data to the PDS central catalog and maintenance of image data sets.

The RPIF testbed at USGS, Flagstaff, shall have responsibility to develop, implement, maintain and deliver geometric and radiometric calibration data and documentation for planetary framing camera data. The funding of USGS to conduct these activities shall be separate from PDS funding. On the other hand, the activities directly relate to PDS and therefore are included in this discussion.

The RPIF testbed at Washington University shall have the responsibility for developing and implementing database management techniques for searching, accessing, and displaying planetary image data.

All three facilities shall cooperate in developing an image processing capability for the RPIFs. Included in that development, but under funding separate from the PDS, is the development of a micro-VAX based system to search, retrieve, and process images. The system will employ a relational software package; the USGS calibration and processing software; CD-ROMs for EDR digital storage; videodisks for electronic browse; and a variety of data analysis tools gleaned from all three RPIF testbed nodes.

3.1.6.1.1.1.7 Reflectance Spectroscopy Node - No Synonyms

The University of Hawaii has been involved in the PDS at a low level of funding. They acquire, maintain, and analyze significant quantities of Earth-based spectral reflectance observations, together with some spectral imaging data. With PDS funding they have investigated using the INGRESS relational software to organize and access their spectral library. The uniqueness of their data makes them a good candidate to be either a PDS discipline or data node prototype.

3.1.6.1.1.1.2 Discipline Subnodes - Data-Node

A discipline sub-node, or data node, is a data management unit which contains a single dynamic data set, e.g. data that remain in a state of change after the proprietary period of a flight mission has ended. In lieu of submitting a final data set to the PDS, an investigator may elect to propose the establishment of a data node as an appendage of the appropriate discipline node. The procedure allows the data to be made available to others in an investigator controlled mode while not requiring that it be submitted to archive as a final data set. Access to the data node shall be through the discipline node and the task could be physically located within that facility.

A data node must make the availability of the data set known, must provide access to the sortable attributes of these data, and must make the latest version of the data set available for distribution. The data node investigator must also make himself available to aid others in the use of the data set and advise as to its reliability and predictability. These stipulations can be met through contracts established with the discipline node and the central node.

An investigator must propose a finite period for the existence of a data node and must interact within the discipline node to assure that format and discipline specific constraints are met. A period of extension can be proposed. At the close of operations of the data node, the investigator shall submit the final data set to the central node for quality control and entrance into the PDS.

3.1.6.1.1.2 Institutions/Facilities - No Synonyms

The group of external interfaces which are Institutions and Facilities are all sources of planetary science data and may request data for archival or reference purposes.

The PDS will share common goals with other institutional archives. An interface should be maintained to assure that common goals are realized and pursued in a systematic fashion.

3.1.6.1.1.2.1 SFOC - Space-Flight-Operations-Center

The Space Flight Operations Center (SFOC) will be the primary supplier of planetary data for future missions. For PDS Version 1.0 there will be no direct interface between the operational PDS and SFOC. The PDS technology development team will interface with the SFOC prototype development activity in the exploration of standard data formats, nomenclature and data management capabilities, common communication facilities and common data display and analysis capabilities. PDS system design and management elements will interface with SFOC representatives to insure commonality of development activities and integration of mutual requirements for the operational SFOC and later versions of PDS.

3.1.6.1.1.2.2 NSSDC - I-4

The National Space Science Data Center (NSSDC) was established by NASA to provide data and information from space-science experiments in order to support additional studies beyond those performed by principal investigators. NSSDC produces catalogs, user guides, and reports on active and planned spacecraft and experiments and also maintains a staff to interact with and support users.

The goals of NSSDC are to further the widest practical use of reduced data obtained from space-science investigations and to provide investigators with an active repository for such data. NSSDC is responsible for the collection, organization, storage, announcement, retrieval, dissemination, and exchange of data received from satellite experiments, sounding-rocket probes, and high altitude aeronautical and balloon investigations. In addition, NSSDC collects some correlative data, such as magnetograms and ionograms, from ground-based observatories and stations for NASA investigators and for on-site use at NSSDC in the analysis and evaluation of space-science experimental results. The above description of the role of NSSDC was exerpted from Reference <1> listed in the Applicable Documents (2) section. (Refer to Data Flow Diagrams: DFD-7.5, DFD-3)

3.1.6.1.2 PDS Users - I-1

The group of external interfaces which are PDS Users all access the PDS catalog and browse facilities and request planetary data sets. (Refer to Data Flow Diagrams: CSD-0, DFD-1, DFD-0, DFD-5, DFD-6.1, DFD-6)

Inputs:	**From:**
System Responses	Support Communications
Data Files	Support Communications
System Responses	Access System
Data Files for On Line Distribution	Access System
Data for Physical Distribution	Distribute Data
Data for Physical Distribution	Process Order Manually
User Inquiry Response	Route User Request

User Education Materials	Prepare User Education Manual
User Education Materials	Customer Support
User Inquiry Response	Customer Support
User Education Materials	Administer System
Data for Physical Distribution	Planetary Data System
User Education Materials	Planetary Data System
System Responses	Planetary Data System

Outputs:	**To:**
User Input	Planetary Data System
User Input	Access System
User Input	Support Communications
User Inquiry	Database Administration
User Inquiry	Route User Request

3.1.6.1.2.1 Pilot Users - No Synonyms

Pilot users are the scientists and support personnel at the PDS Version 1.0 science testbeds.

3.1.6.1.2.2 Selected Outside Users - No Synonyms

Selected Outside Users are individuals and institutions selected by the Science Working Group to test and evaluate the PDS Version 1.0.

3.1.6.2 Physical Interfaces

Physical Interfaces describes the pathways by which external users shall gain access to the PDS.

3.1.6.2.1 Direct Connect

The Direct Connect interface shall be supported by PDS as the primary point of access for local users.

Facilities shall be provided for "logon" access to the PDS VAX, which shall be the only access to the PDS user interface in Version 1.0.

Facilities shall be provided for transfer of data files with Direct Connect.

Facilities shall be made available to PDS data sources to input their data via Direct Connect access to PDS.

3.1.6.2.2 Dial In

The Dial In interface shall be supported by PDS.

Facilities shall be provided for "logon" access to the PDS VAX, which shall be the only access to the PDS user interface in Version 1.0.

Transfer of data from PDS to a user through Dial In shall be accommodated via standard protocols which shall include but not be limited to: Kermit, and Xmodem.

Facilities shall be made available for PDS data sources to input small data sets via Dial In.

3.1.6.2.3 SPAN

The SPAN interface shall be supported by PDS as a general pathway for access of computer equipment at NASA supported centers.

Facilities shall be provided for "logon" access to the PDS VAX, which shall be the only access to the PDS user interface in Version 1.0. Logoff shall appear the same through SPAN as through normal access (such as dial-in).

Facilities shall be provided for transfer of data files with SPAN. Transfer of files shall be accommodated through the use of the copy system functions. The source file specification in the system function shall be allowed to contain a SPAN node identifier, thus allowing a SPAN user to copy from any computer on the SPAN network. No specific requirement is inferred about copying "to" a SPAN node. Initially, the user shall be limited to "logging on" to the foreign node, and copying from the desired source.

Facilities shall be made available to PDS data sources to input their data via the SPAN network to PDS.

3.1.6.2.5 ILAN

Facilities shall be made available for "logon" access to the PDS VAX from the JPL Institutional Local Area Network (ILAN). Logon shall appear the same through ILAN as through normal access (such as dial-in).

Transfer of data from PDS to a user through ILAN shall be accommodated via standard protocols which shall include but not be limited to: Kermit, and Xmodem.

Facilities shall be provided to PDS data sources to input their data via the ILAN network to PDS.

3.1.6.2.6 Magnetic Tape

The Magnetic Tape interface shall be supported on PDS.

Transfer of data from PDS to a user via Magnetic Tape shall be accommodated through use of a standard protocol which shall be SFDUs in Version 1.0.

Facilities shall be made available to PDS data sources to input their data via Magnetic Tape to PDS through use of a standard protocol which shall be SFDUs in Version 1.0.

3.1.6.3 Internal Interfaces

PDS shall maintain interfaces to distributed elements of the PDS during Version 1.0. These interfaces shall form the basis for the greatly expanded distributed architecture planned for PDS Versions 2.0 and 3.0.

3.2 Design and Implementation

3.2.1 Functional Priorities

Both the functional capability and data sets for PDS Version 1.0 have been categorized and prioritized into the following three categories:

1. Critical

2. Important

3. Nice

The Functional Priorities (3.2.1) appendix contains a list of the functions and their corresponding categorization. This list shall be used throughout the development process to ensure that the most critical functions are developed first. These priorities shall also be used, should a need for descoping arise during the development process, to determine which functional capabilites to postpone until a later delivery (e.g. until Version 2.0). The Version 1.0 Data Sets (C) appendix contains a list of the data sets and their corresponding categorization.

3.2.2 System Development Responsibility

Responsibility for the development of the various functions for PDS Version 1.0 shall be shared among system development personnel at the central node at JPL and at the various prototype discipline/data nodes. Functional Prioritization (D) contains a list of the various functions and the name of the responsible node. The development process at each responsible node shall conform to the standards established in Programming Requirements (3.3.2). Responsibility for system integration and testing shall belong to the central node at JPL.

3.2.3 Discipline/Data Node Activity

The prototype discipline/data nodes (science testbeds) shall participate in PDS Version 1.0 as described below in descending order of priority.

1. Support the PDS Data Management Team in defining the logical design (schema) of the catalog and in preparing the data dictionary.

2. Restore, convert to PDS standard format, and document the data sets specified in Version 1.0 Data Sets (C).

3. Support the PDS Data Management Team in loading actual data into the PDS.

4. Serve on project review boards for quality assurance and configuration management of data and software products.

5. Design, implement, unit test and document the software functions specified in Version 1.0 Data Sets (C).

6. Design, implement, unit test and document access software for the data sets in part 2 above to facilitate science analysis.

7. Perform other such tasks as are specified in the annual contract between JPL and their home institution.

3.3 Processing Resources

This section defines PDS requirements that are independent of specific functions and have been established for programmatic, budgetary, or external reasons.

3.3.1 Computer Hardware Requirements

The hardware required for the Central node of the PDS Version 1.0 is described in the Central Site Britton-Lee Database Machine HWCI (3.1.5.2) section, and Communications Network HWCI (3.1.5.3). The hardware required for the Discipline nodes is described in the Discipline Node HWCI (3.1.5.4) section.

3.3.2 Programming Requirements

Application programming will involve both commercial packages and specially written application code. All software developed for the PDS Project shall comply with the standards established in the JPL Software Management and Development Standard (JPL 500-152). Further guidelines are provided in the PDS Software Management Plan (SMP).

3.3.2.1 Programming Languages

Application programming shall be developed in either the Fortran or "C" programming languages.

3.3.2.2 Design and Coding Constraints

Programming and style standards shall be those established in the PDS Software Management Plan. Programming updates shall be under strict configuration management control as established in the PDS Configuration Management Plan.

3.4 Quality Factors

3.4.1 Reliability

The reliability of the central node PDS hardware shall be 1000 hours mean time between failure (MTBF) of critical elements. Critical elements include the following:

1. VAX central processing unit and memory
2. Britton Lee Processor and memory
3. Disk unit (VAX and Britton Lee)
4. VAX-Britton Ethernet connection
5. Communications equipment for SPAN
6. Minimum of 8 asynchronous dial in ports

7. System console

Critical elements specifically **do not** include the following:

1. Magnetic tape drives

2. Cartridge tape units

3. Printers

4. Excess communications ports beyond the 8 specified above.

3.4.2 Maintainability

The hardware maintainability of the PDS central node equipment shall be 4 hours mean time to repair (MTTR) for failures occurring during normal working hours (8-5 PST, M-F) and 16 hours MTTR for failures occuring outside of normal working hours.

All software and hardware configuration changes shall be under strict configuration management as specified in the PDS Configuration Management Plan.

3.4.3 Availability

The PDS shall have an availability of .98. Not included in the above calculation will be periods of unavailability due to:

1. Communications or network failure.

2. Planned hardware preventative maintenance.

3. Planned system hardware reconfigurations

4. Planned system software reconfigurations

3.4.4 Expandability

The PDS design and architecture shall permit future expansions as follows:

1. Up to 32 discipline/data nodes

2. On line science data storage expansion to 10 gigabytes (X 10) per node

3. Processing Power to 4 MIPS per node (X 4)

4. Supported simultaneous users to 32 per node (X 4)

5. Attachment to different communications networks (such as PSCN)

3.4.5 Performance Requirements

1. The PDS shall support up to eight (8) simultaneous interactive users with response times not exceeding those available on an unloaded system by a factor of 1.5.

2. The PDS shall respond to all commands within five (5) seconds of the entry of the command termination character.

3. The PDS shall be able to retrieve data from the DBMS at a rate of at least 50,000 bytes per second.

4. The PDS shall have a communication bandwidth of a least 10,000 bytes per second.

3.4.6 Additional Quality Factors

The PDS design shall give particular attention to the friendliness of the user interface.

The PDS design shall promote a distributed architecture where data and control is distributed among all the nodes.

3.5 Logistics

3.5.1 Hardware Support

The hardware identified in the PDS Central Site Computer HWCI (3.1.5.1) and in the Central Site Britton-Lee Database Machine HWCI (3.1.5.2) sections shall be housed at JPL and shall be allocated at least 400 square feet in an appropriately air-conditioned building. An additional 100 square feet shall be allocated for storing up to 400 tapes for PDS archival purposes. Also a user support area of at least 800 square feet shall be allocated adjacent to the above facilities. The generic VAX terminals and plotter shall be located in this area as well as the PDS documentation library. Maintenance agreements shall be established for equipment utilized in the operational PDS as specified in the PDS Operations Plan. Preventive maintenance shall be performed on the equipment as specified in the PDS Operations Plan.

3.5.2 Software Support

Configuration management of operational PDS software shall be performed as specified in the PDS Configuration Management Plan. Software maintenance shall be performed by a software maintenance team, with participation by the original system developers where possible, under the guidance of the PDS Change Control Board.

3.5.3 Personnel Support

Operational Phase

A customer support staff consisting of both a full-time VAX System Manager and a full time PDS User Consultant operator shall be assigned to support the operational PDS and to perform the functions specified in Customer Support (3.1.4.5.1). In addition, support for SPAN shall be provided by the JPL SPAN Representative. A database administrator (DBA) shall also be assigned half-time to support the operational PDS. User training shall be provided as specified in the PDS Operations Plan.

Development Phase

During the development phase, a full-time data administrator (DA) shall be assigned to perform the functions specified in Acquire Data (3.1.4.5.4.6). The DA shall be fully supported by the PDS Data Management Team (DMT).

A Quality Assurance Evaluator shall also be assigned half-time to perform the functions specified in Test Science Data Software (3.1.4.6.3.4) and to ensure that all products comply with the standards established in the PDS Product Assurance Plan.

The proposed project structure during the development phase is shown in Project Organization (E).

4 Qualification Requirements

In conformance to the JPL Software Management Standard (500-152), the PDS Project shall produce the following document set:

Project Plan	D-3492
User Requirements Document	D-3493
Software Management Plan	D-3487
Configuration Management Plan	D-3488
Product Assurance Plan	D-3489
Task Implementation Plan	
System Specification	D-3454
System Integration and Test Plan	D-3494
Acceptance Test Plan	D-3495
System/Subsystem Functional Design Document	D-3496
Software Specification Document	D-3497
Software Interface Specification	D-3498
User's Guide	D-3500
Release Description Document	D-3499
Transfer Agreement	D-3501
Operations Plan	D-3502

The requirements, standards and procedures for software quality assurance shall be as specified in the PDS Software Product Assurance Plan. There are no plans for an independent test group to perform independent validation and verification (V&V).

The functional and performance tests to be performed on the PDS, during the development period, in order to validate that the system complies with the functional requirements shall be as specified in the PDS System Integration and Test Plan. Both the acceptance criteria and the corresponding tests and procedures to be performed on the PDS prior to delivery shall be as specified in the PDS Software Acceptance Test Plan.

5 Preparation for Delivery

The preparations for delivery shall be as specified in the PDS Software Management Plan and in the PDS Configuration Management Plan. The act of delivering will not involve the actual transfer of any physical hardware, since this already exists at the central node at JPL. Delivery shall be accomplished by merely loading the executable PDS software onto the JPLPDS VAX.

6 Acronyms and Abbreviations

The following is a list of abbreviations and acronyms used in this document.

CDROM	Compact Disk Read Only Memory
CODMAC	Committee of Data Management and Computation
CSCI	Computer Software Configuration Item
CSD	Context System Diagram
CVD	Configurational View Diagram
DBMS	Database Management System
DEC	Digital Equipment Corporation
DECnet	Digital Equipment Corporation Network
DFD	Data Flow Diagram
FY	Fiscal Year
Gigabytes	1 billion bytes
Graphics IDL	Image Display Language
HWCI	Hardware Configuration Item
IDL	Interactive Database Language
IDM	Intelligent Database Machine
ILAN	Institutional Local Area Network
IR	Infrared
IRR	Infrared Radiometer
IRS	Infrared Spectrometer
IRTM	Infrared Thermal Mapper
ISO	International Standards Organization, Information Systems Office
JPL	Jet Propulsion Laboratory
LPM	Lines Per Minute
M	Mega (1 million)
Mbytes	Megabytes (1 million bytes)
MIPS	Million Instructions Per Second
MTBF	Mean Time Between Failure
MTTR	Mean Time to Repair
K	Kilo (1 thousand)
Kbps	Kilo bits per second
LASP	Laboratory for Atmospheric and Space Physics
MAWD	Mars Atmosphere Water Detector
MOU	Memo of Understanding
NAIF	Navigation Ancillary Information Facility
NASA	National Aeronautics and Space Administration
NSSDC	National Space Science Data Center
OSSA	Office of Space Science and Applications
PDS	Planetary Data System
PPDS	Pilot Planetary Data System
PSCN	Program Support Communications Network
PSD	Planetary Science Data
RPIF	Regional Planetary Image Facility
SAI	Science Applications International
SFDU	Standard Formatted Data Unit
SFOC	Space Flight Operations Center
SPAN	Space Physics Analysis Network
SSDMU	Space Science Data Management Unit

SSED	Solar System Exploration Division
TAE	Transportable Application Executive
UCLA	University of California at Los Angeles
USGS	United States Geological Survey
UVS	Ultraviolet Spectrometer
VAX	Virtual Access Extension (DEC computer)
VMS	Virtual Memory System (VAX operating system)

A Data Flow Diagrams

The diagrams contained in this Appendix were developed using the structured analysis methodology as described by Tom DeMarco in his book *Structured Analysis and System Specification.* The Appendix contains two types of diagrams: Context Diagrams (CSDs) and Data Flow Diagrams (DFDs). The Context Diagram shows the context of the system or the system boundary. The DFDs show a logical partitioning of the system and the flow of data through the system. DFDs do not show the flow of control through the system or procedural information. The procedural information is contained in the textual descriptions of the functions. For those readers who are not familiar with data flow diagrams, the basic graphic conventions of DFDs (and CSDs) are briefly described below.

The four basic elements of DFDs are:

1. *Processes,* represented by named circles or "bubbles." A process is a transformation of incoming data flow(s) into outgoing data flow(s).

2. *Data flows,* represented by named vectors. A data flow is a pipeline through which packets of information of known composition flow.

3. Files, or *Data Stores,* represented by a name between two parallel, straight lines. A data store is a temporary repository of data.

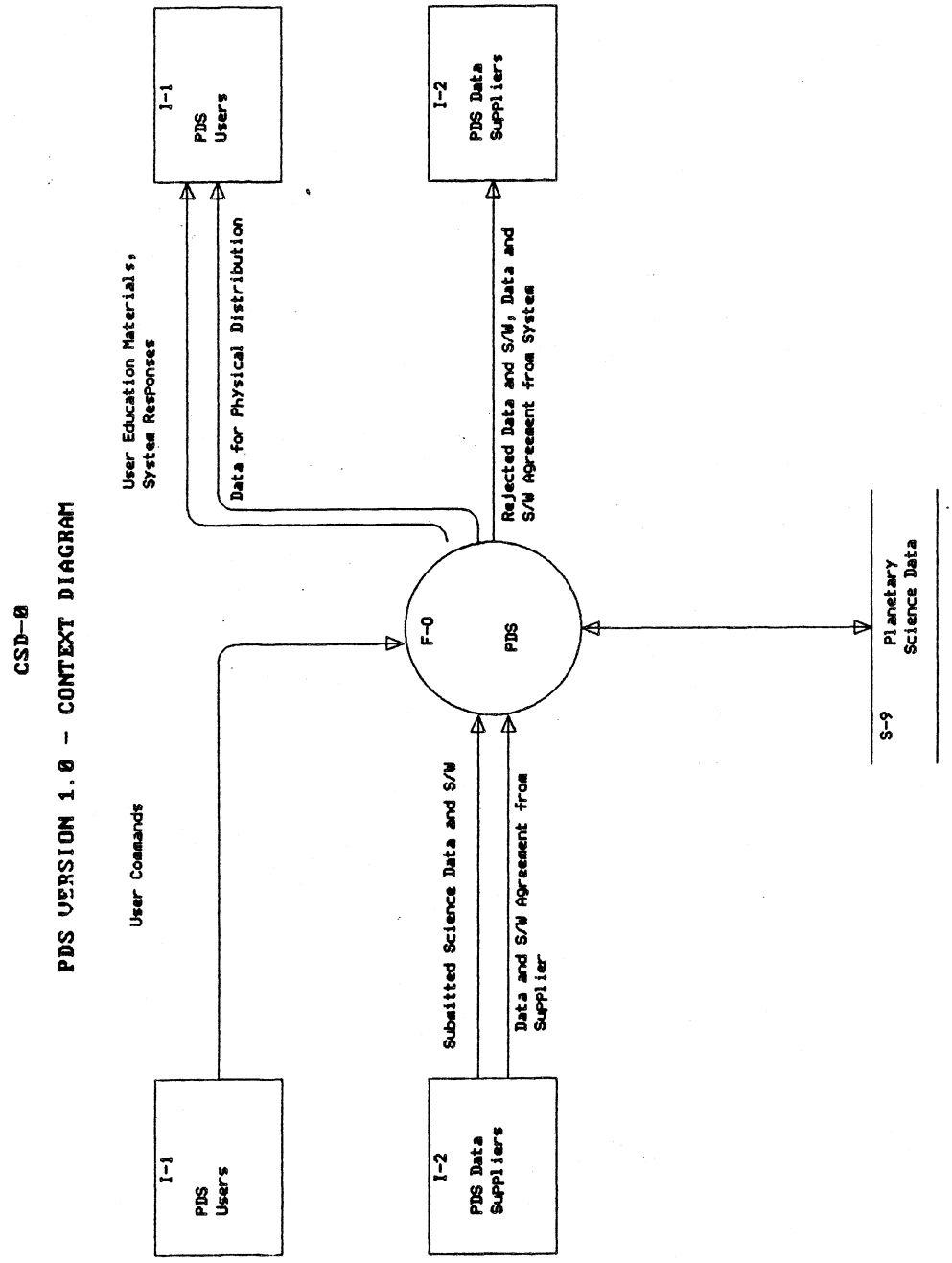
4. *External Interfaces,* represented by named boxes. An external interface is a person or organization lying outside the context of a system, that is a net originator or receiver of system data.

For clarification as to where inputs come from or where outputs are going to across a page boundary, a fifth element is included. These are *Off-Page Connectors* represented by small circles. These symbols contain the function number (explained below) of the function that will generate or receive the data flow.

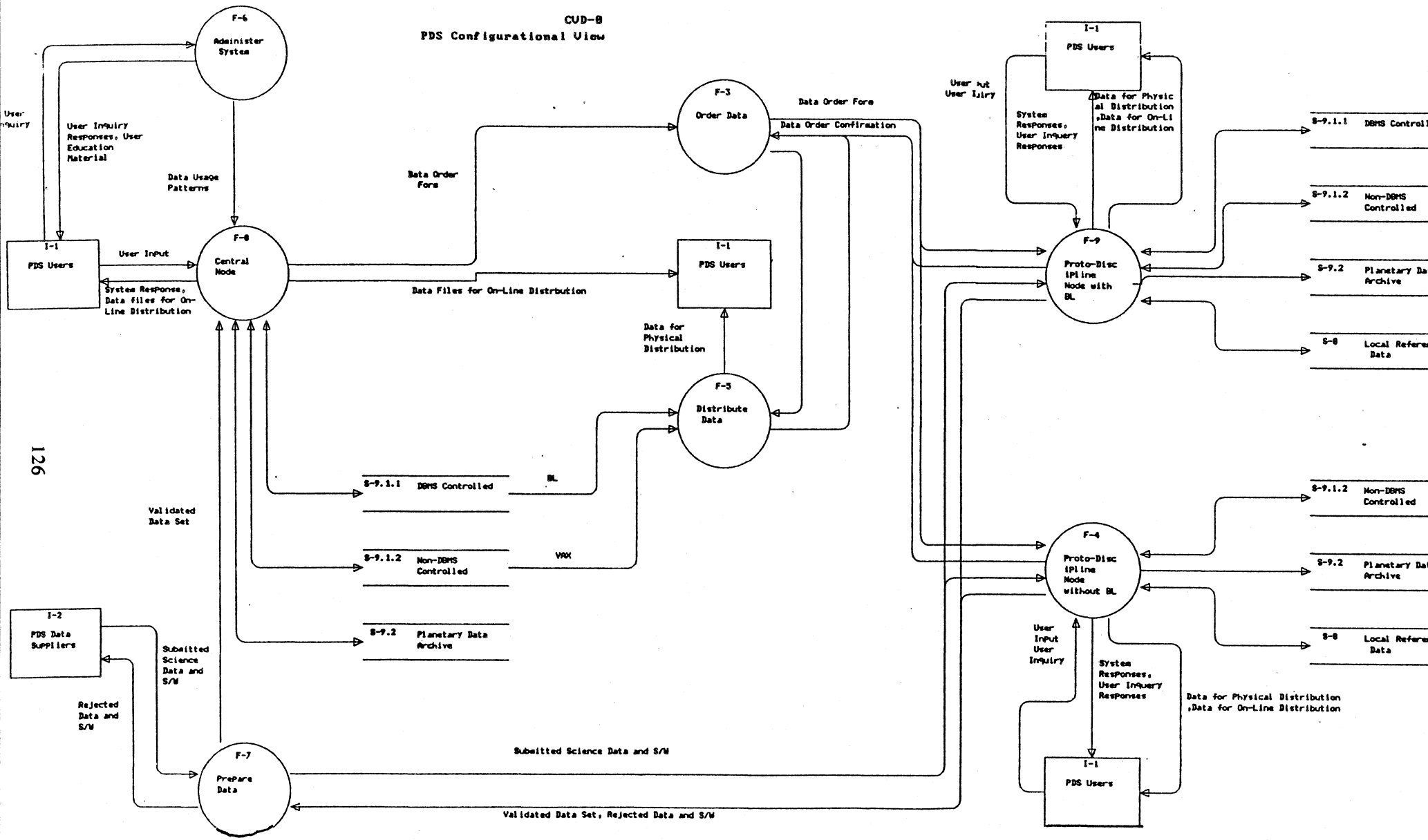
There is a numbering convention for the diagrams and processes. This numbering convention is based on the functional decomposition of the processes in the system. The first level diagram is arbitrarily numbered 0, so this diagram is called DFD-0. DFD-0 contains the top level processes of the system. These processes are numbered F-1, F-2, etc. These top level processes are decomposed into separate diagrams labeled DFD-1, DFD-2, etc. In other words, each diagram receives the number of the related process on the parent diagram preceded by the string "DFD-." Process numbers are formed by concatenating the string "F-," the diagram number, a decimal point, and a unique number local to that diagram.

The level of a given diagram can be determined by counting the decimal points in the process numbers. For instance, the process number F-1.1.2 is at level 2 because its number contains two decimal points. Also, the diagram a particular process appears on can be determined by subtracting its last digit. For instance, process number F-1.1.2 appears on diagram DFD-1.1.

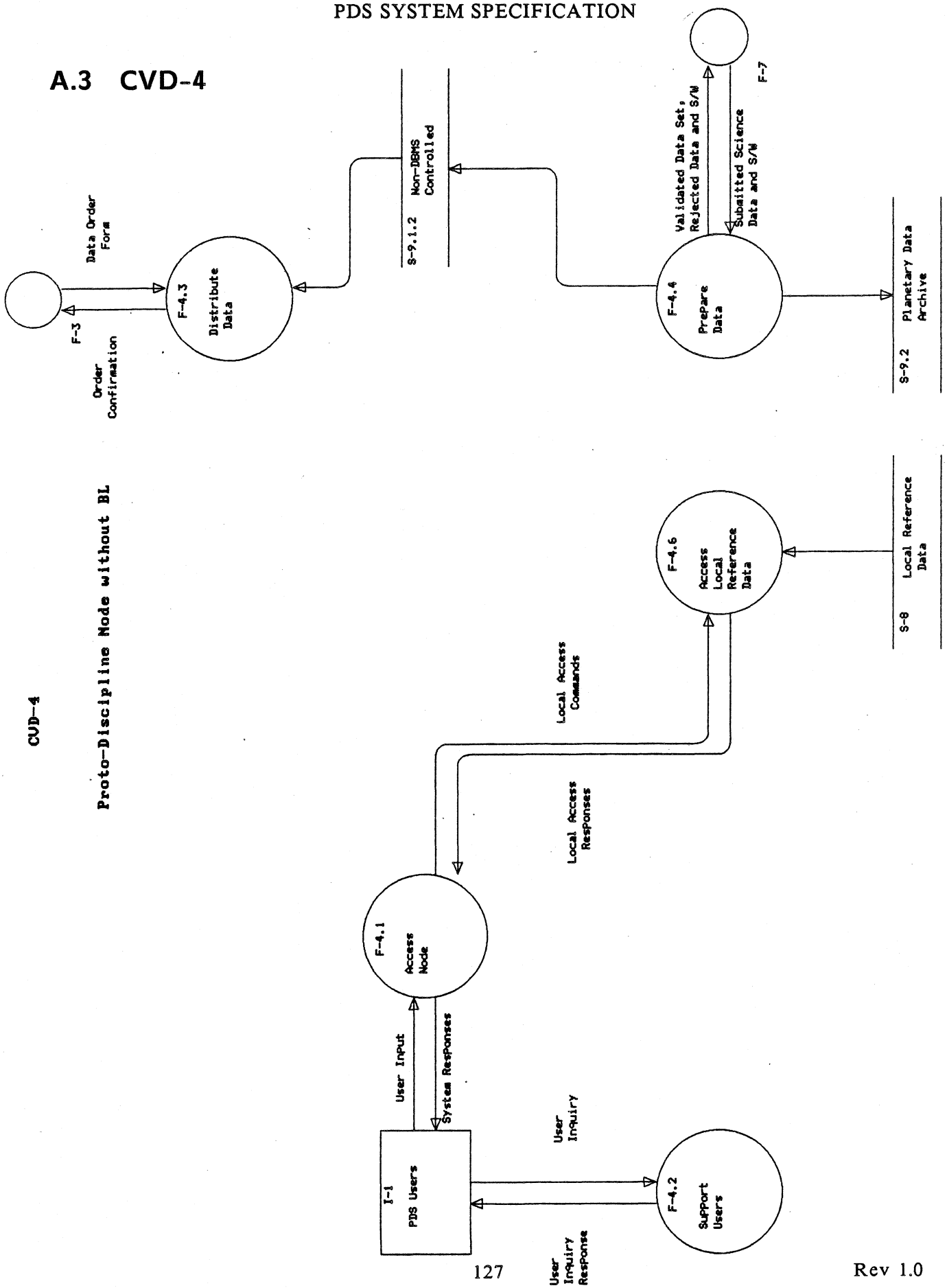
A.1 CSD-0


CSD-0
PDS VERSION 1.0 - CONTEXT DIAGRAM
I-1
PDS
Users
I-2
PDS Data
Suppliers
User Education Materials,
System Responses
Data for Physical Distribution
Rejected Data and S/W, Data and
S/W Agreement from System
User Commands
Submitted Science Data and S/W
Data and S/W Agreement from
Supplier
F-0
PDS
S-9
Planetary
Science Data
I-1
PDS
Users
I-2
PDS Data
Suppliers

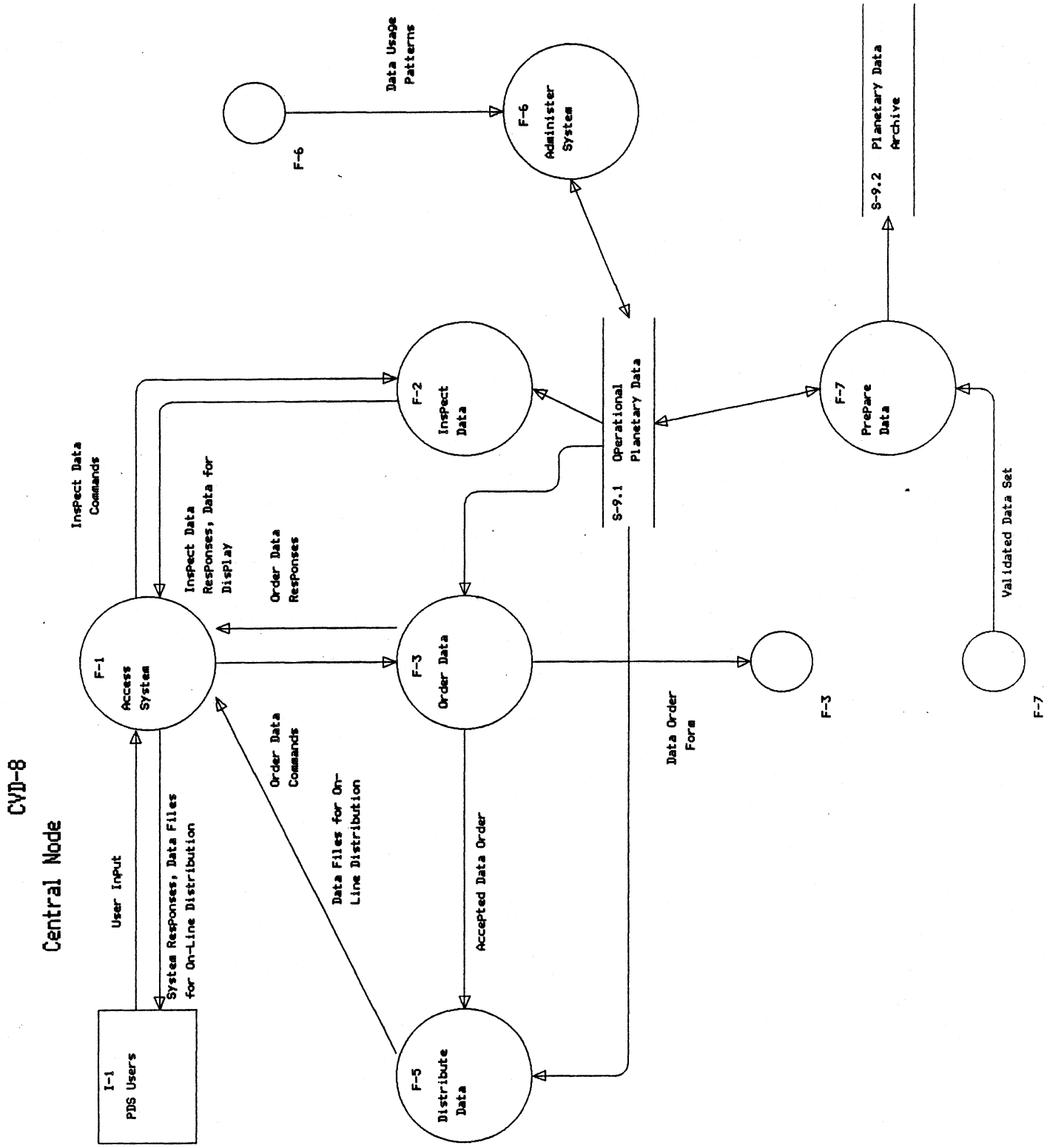
A.2 CVD-0


CVD-0
PDS Configurational View
F-6
Administer System
F-3
Order Data
F-8
Central Node
F-5
Distribute Data
F-9
Proto-Disc iPline Node with BL
F-4
Proto-Disc iPline Node without BL
F-7
PrePare Data
I-1
PDS Users
I-2
PDS Data Suppliers
User Inquiry Responses, User Education Material
Data Usage Patterns
Data Order Form
Data Order Confirmation
User Input
System Response, Data files for On-Line Distribution
Data Files for On-Line Distribution
Data for Physical Distribution
System Responses, User Inquery Responses
Data for Physical Distribution ,Data for On-Line Distribution
S-9.1.1 DBMS Controlled
S-9.1.2 Non-DBMS Controlled
S-9.2 Planetary Data Archive
S-8 Local Reference Data
BL
VAX
Validated Data Set
Submitted Science Data and S/W
Rejected Data and S/W
User Input User Inquiry
System Responses, User Inquery Responses
Data for Physical Distribution ,Data for On-Line Distribution
Submitted Science Data and S/W
Validated Data Set, Rejected Data and S/W

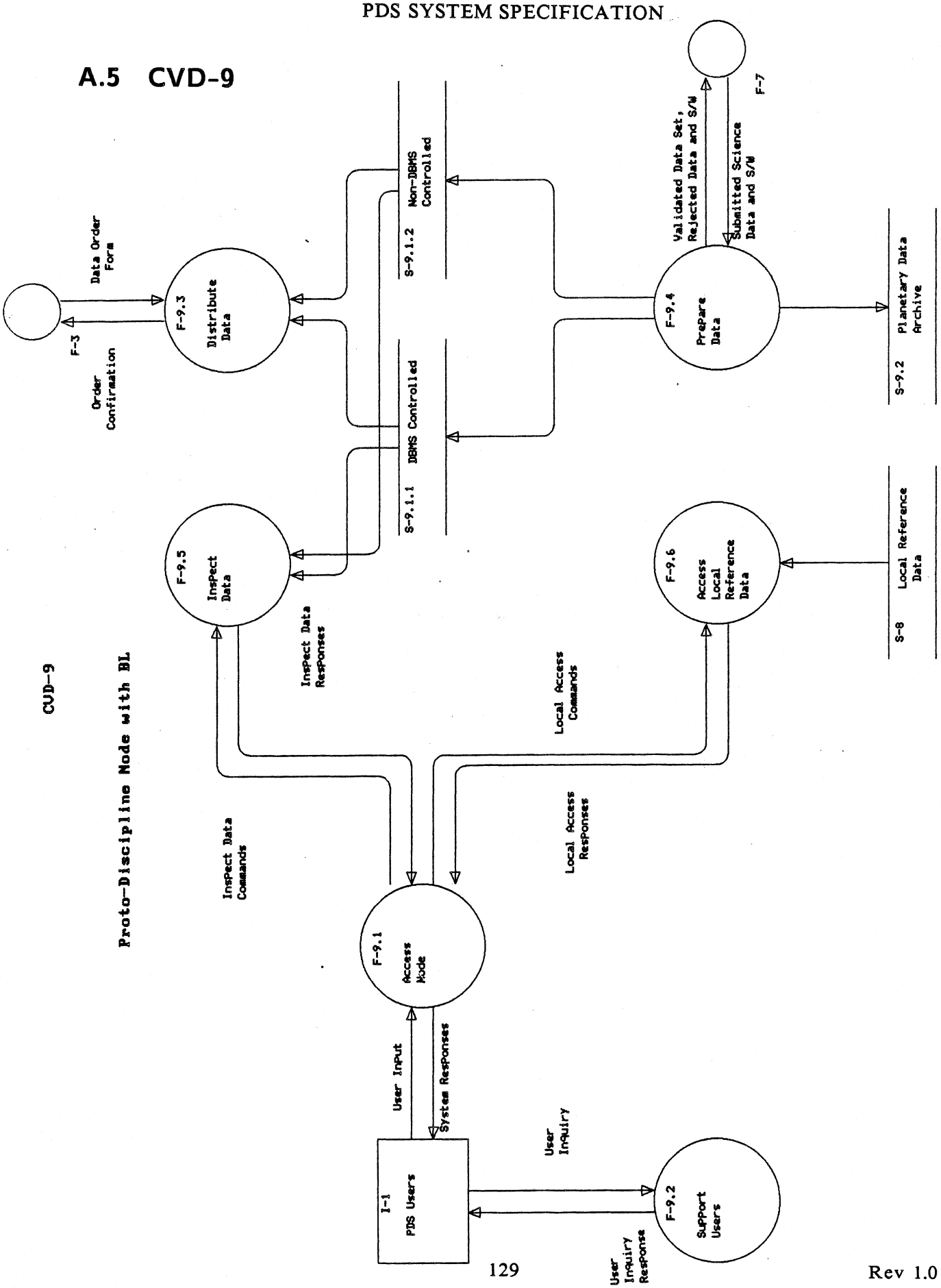
A.3 CVD-4


CVD-4
Proto-Discipline Node without BL
F-3
Data Order Form
Order Confirmation
F-4.3
Distribute Data
S-9.1.2 Non-DBMS Controlled
F-4.4
Prepare Data
Validated Data Set; Rejected Data and S/W
Submitted Science Data and S/W
F-7
S-9.2 Planetary Data Archive
F-4.6
Access Local Reference Data
S-8 Local Reference Data
Local Access Commands
Local Access Responses
F-4.1
Access Node
User Input
System Responses
I-1
PDS Users
User Inquiry
User Inquiry Response
F-4.2
Support Users

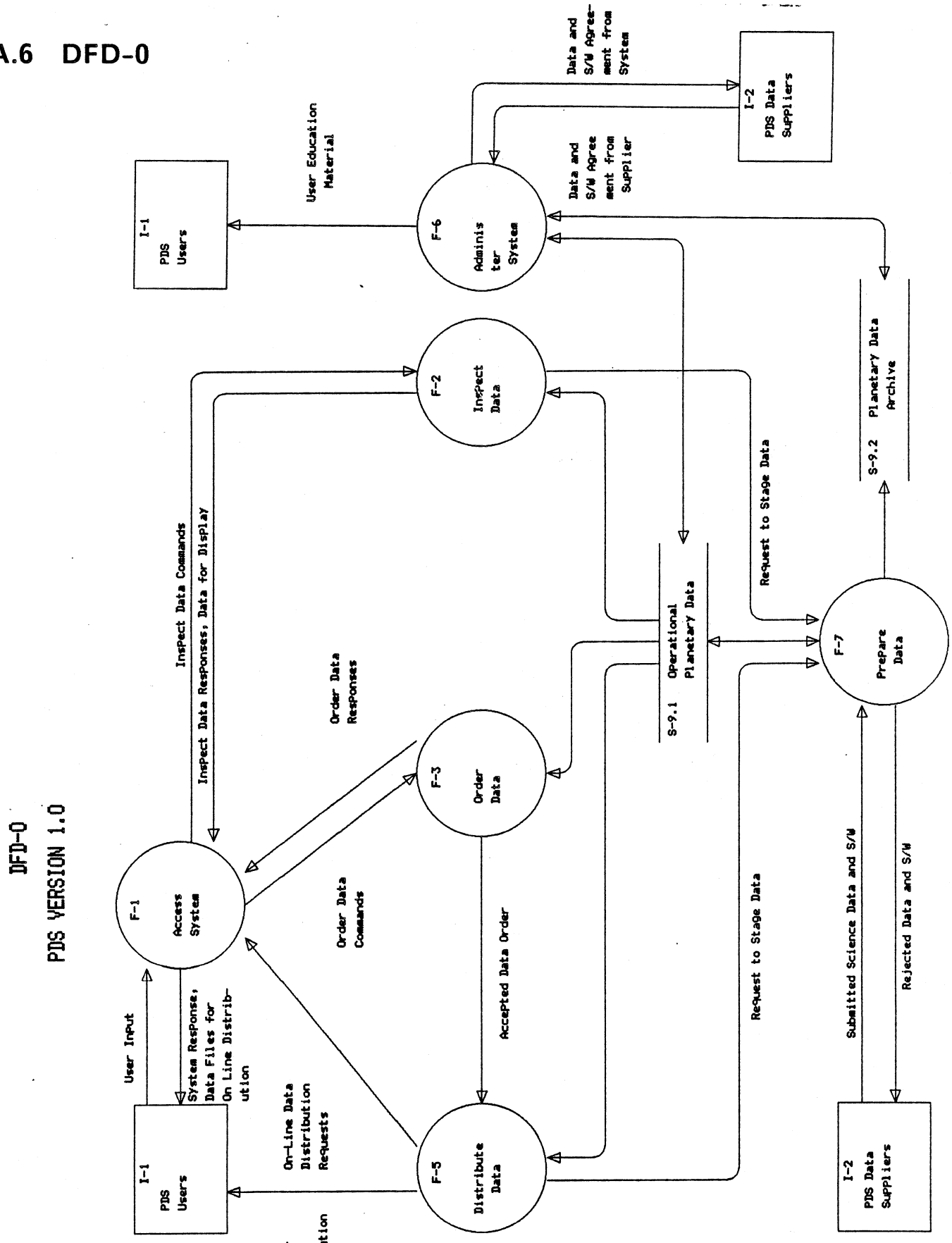
A.4 CVD-8


CVD-8
Central Node
I-1
PDS Users
F-1
Access
System
F-2
Inspect
Data
F-3
Order Data
F-5
Distribute
Data
F-6
Administer
System
F-7
Prepare
Data
F-6
F-3
F-7
S-9.1 Operational
Planetary Data
S-9.2 Planetary Data
Archive
Data Usage
Patterns
Inspect Data
Commands
Inspect Data
Responses, Data for
Display
Order Data
Responses
User Input
System Responses, Data Files
for On-Line Distribution
Order Data
Commands
Data Files for On-
Line Distribution
Accepted Data Order
Data Order
Form
Validated Data Set

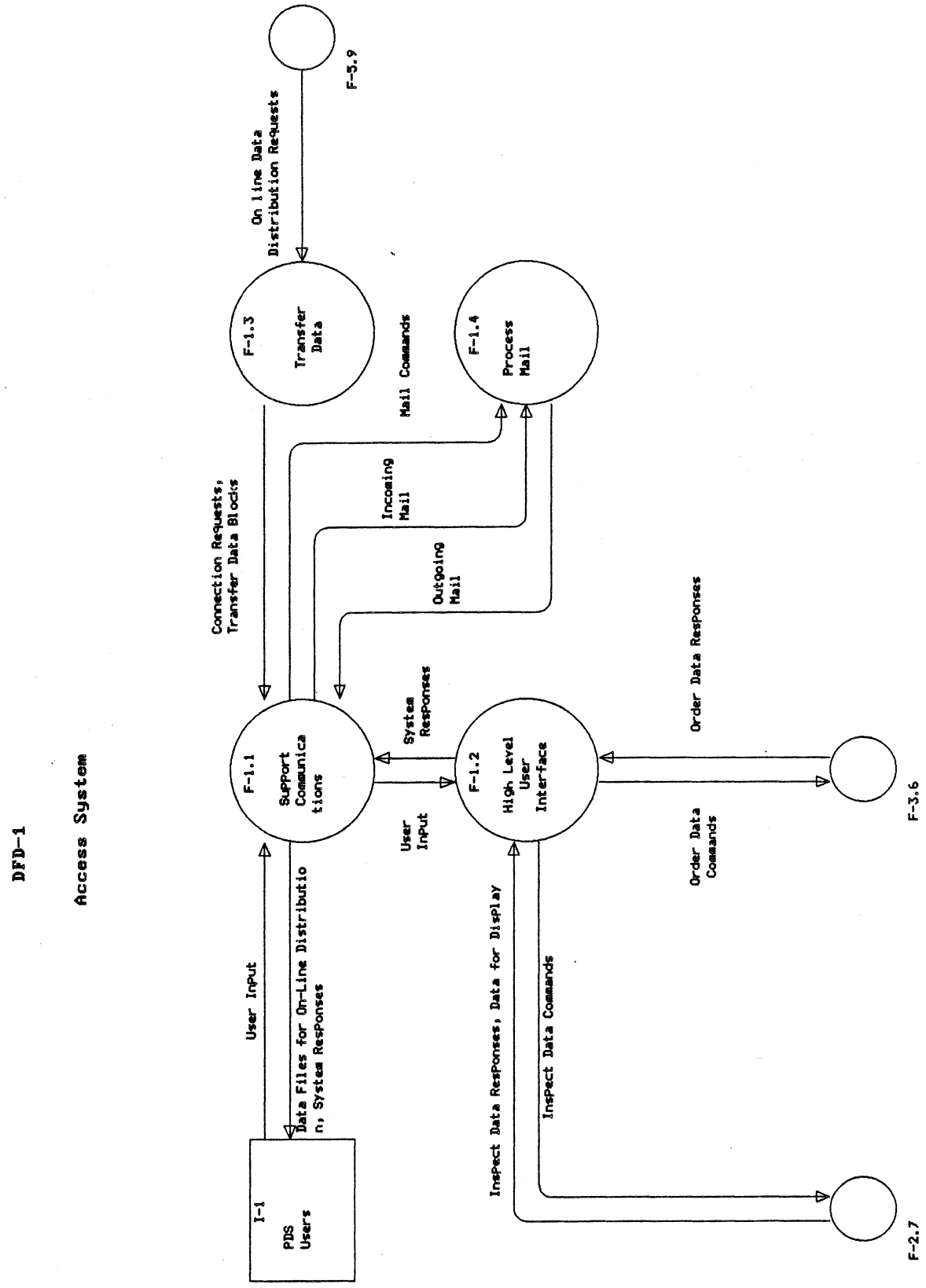
A.5 CVD-9


CVD-9
Proto-Discipline Node with BL
F-3
Data Order Form
Order Confirmation
F-9.3
Distribute Data
S-9.1.2
Non-DBMS Controlled
S-9.1.1
DBMS Controlled
F-9.4
Prepare Data
Validated Data Set; Rejected Data and S/W
Submitted Science Data and S/W
F-7
S-9.2
Planetary Data Archive
F-9.5
Inspect Data
F-9.6
Access Local Reference Data
S-8
Local Reference Data
Inspect Data Responses
Local Access Commands
Inspect Data Commands
Local Access Responses
F-9.1
Access Mode
User Input
System Responses
I-1
PDS Users
User Inquiry
F-9.2
Support Users
User Inquiry Response

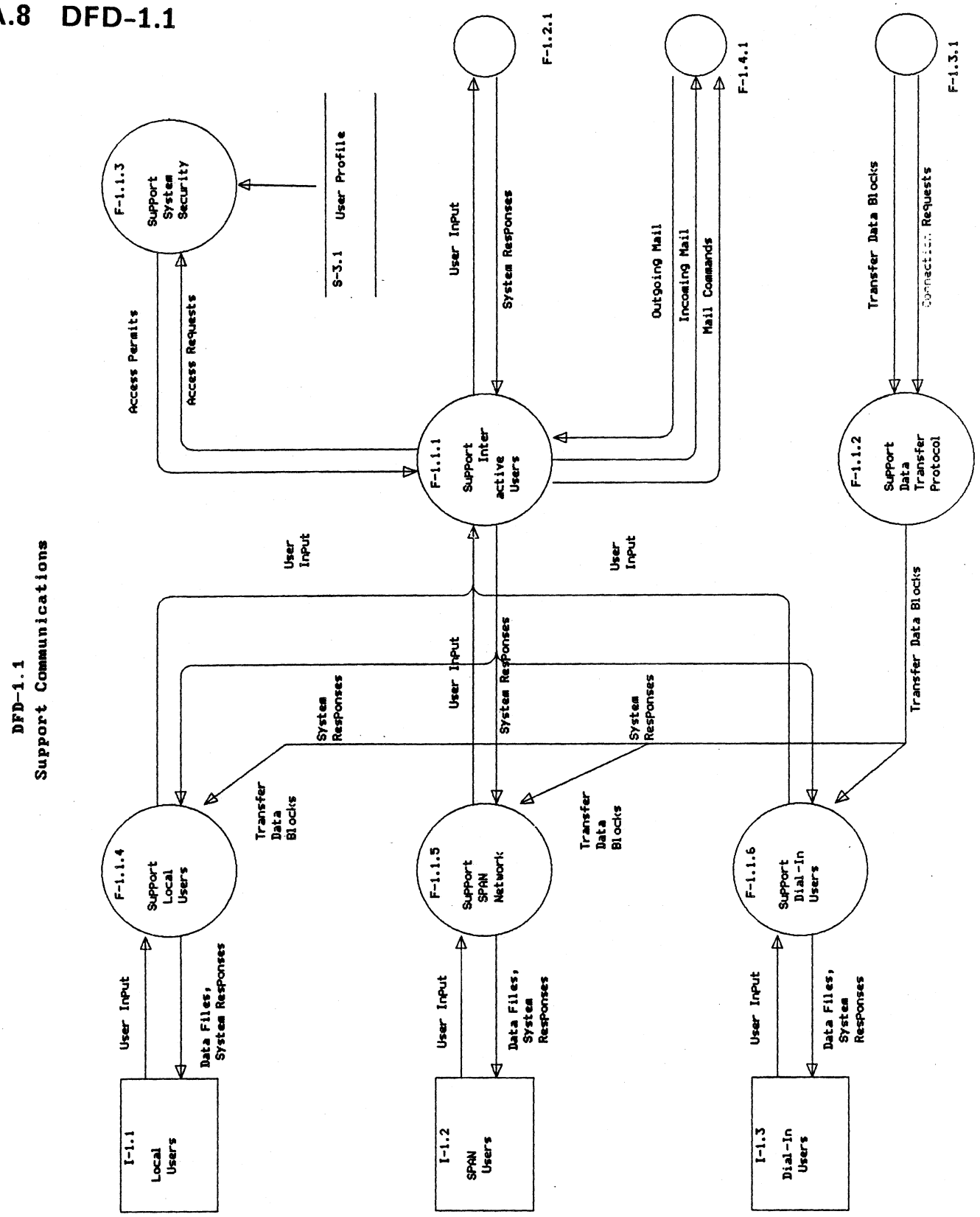
A.6 DFD-0


DFD-0
PDS VERSION 1.0
I-1
PDS
Users
I-2
PDS Data
Suppliers
F-1
Access
System
F-2
Inspect
Data
F-3
Order
Data
F-5
Distribute
Data
F-6
Adminis
ter
System
F-7
Prepare
Data
S-9.1 Operational
Planetary Data
S-9.2 Planetary Data
Archive
User Education
Material
Data and
S/W Agree-
ment from
System
Data and
S/W Agree
ment from
Supplier
Inspect Data Commands
Inspect Data Responses; Data for Display
Order Data
Responses
Order Data
Commands
Accepted Data Order
Request to Stage Data
Request to Stage Data
User Input
System Response;
Data Files for
On Line Distrib-
ution
On-Line Data
Distribution
Requests
Data for
Physical
Distribution
Submitted Science Data and S/W
Rejected Data and S/W

A.7 DFD-1

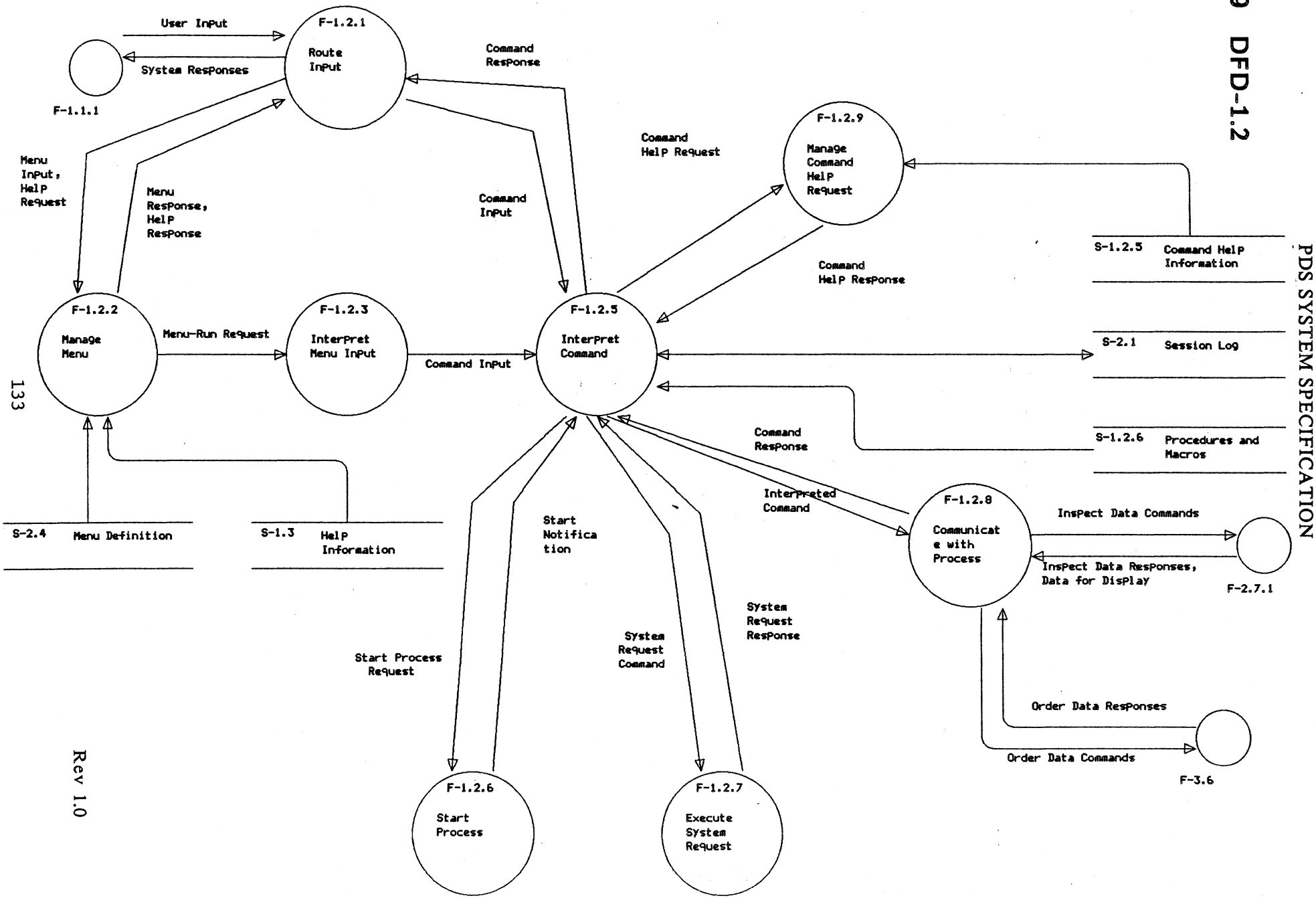

DFD-1
Access System
F-5.9
On line Data Distribution Requests
F-1.3
Transfer Data
F-1.4
Process Mail
Mail Commands
Connection Requests; Transfer Data Blocks
Incoming Mail
Outgoing Mail
F-1.1
Support Communications
System Responses
F-1.2
High Level User Interface
Order Data Responses
F-3.6
User Input
Order Data Commands
User Input
Data Files for On-Line Distribution, System Responses
Inspect Data Responses, Data for Display
Inspect Data Commands
I-1
PDS Users
F-2.7

A.8 DFD-1.1

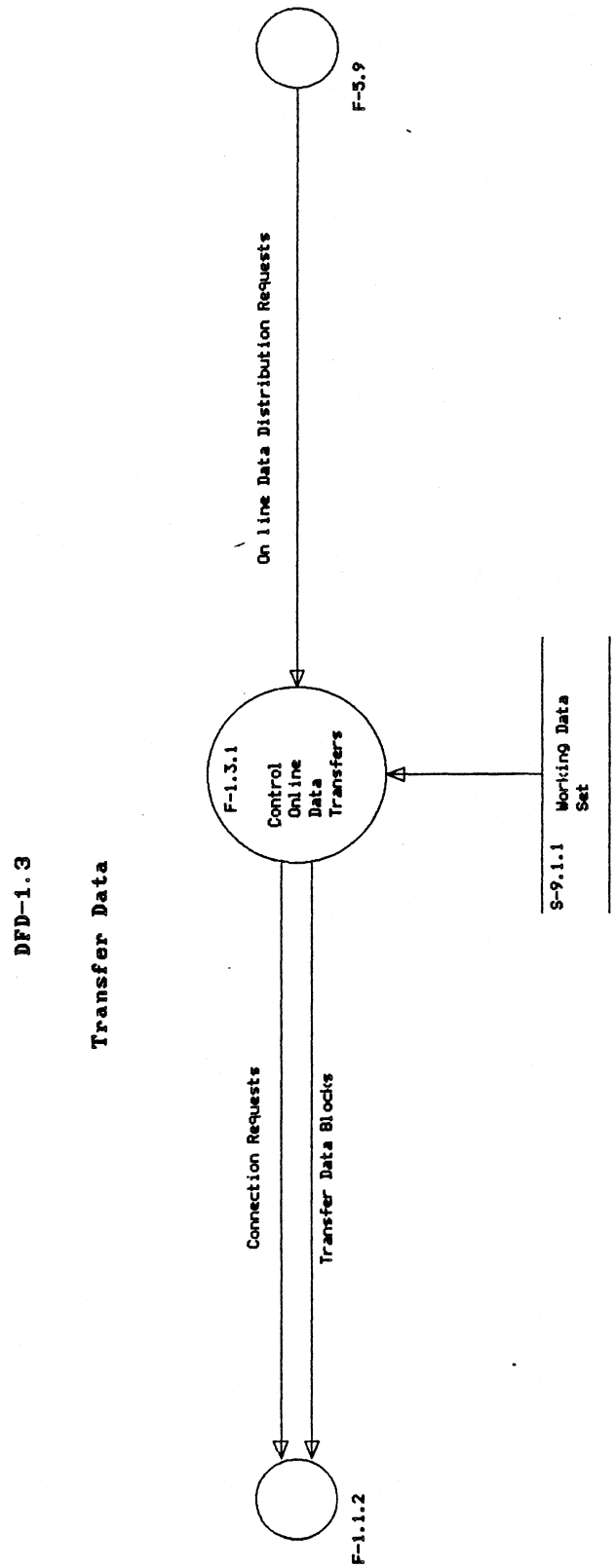

DFD-1.1
Support Communications
F-1.1.1
Support Inter active Users
F-1.1.2
Support Data Transfer Protocol
F-1.1.3
Support System Security
F-1.1.4
Support Local Users
F-1.1.5
Support SPAN Network
F-1.1.6
Support Dial-In Users
F-1.2.1
F-1.4.1
F-1.3.1
S-3.1 User Profile
Access Permits
Access Requests
User InPut
System Responses
Outgoing Mail
Incoming Mail
Mail Commands
Transfer Data Blocks
Connection Requests
User InPut
User InPut
System Responses
User InPut
System Responses
System Responses
Transfer Data Blocks
Transfer Data Blocks
Transfer Data Blocks
User InPut
Data Files; System Responses
User InPut
Data Files; System Responses
User InPut
Data Files; System Responses
I-1.1 Local Users
I-1.2 SPAN Users
I-1.3 Dial-In Users

DFD-1.2

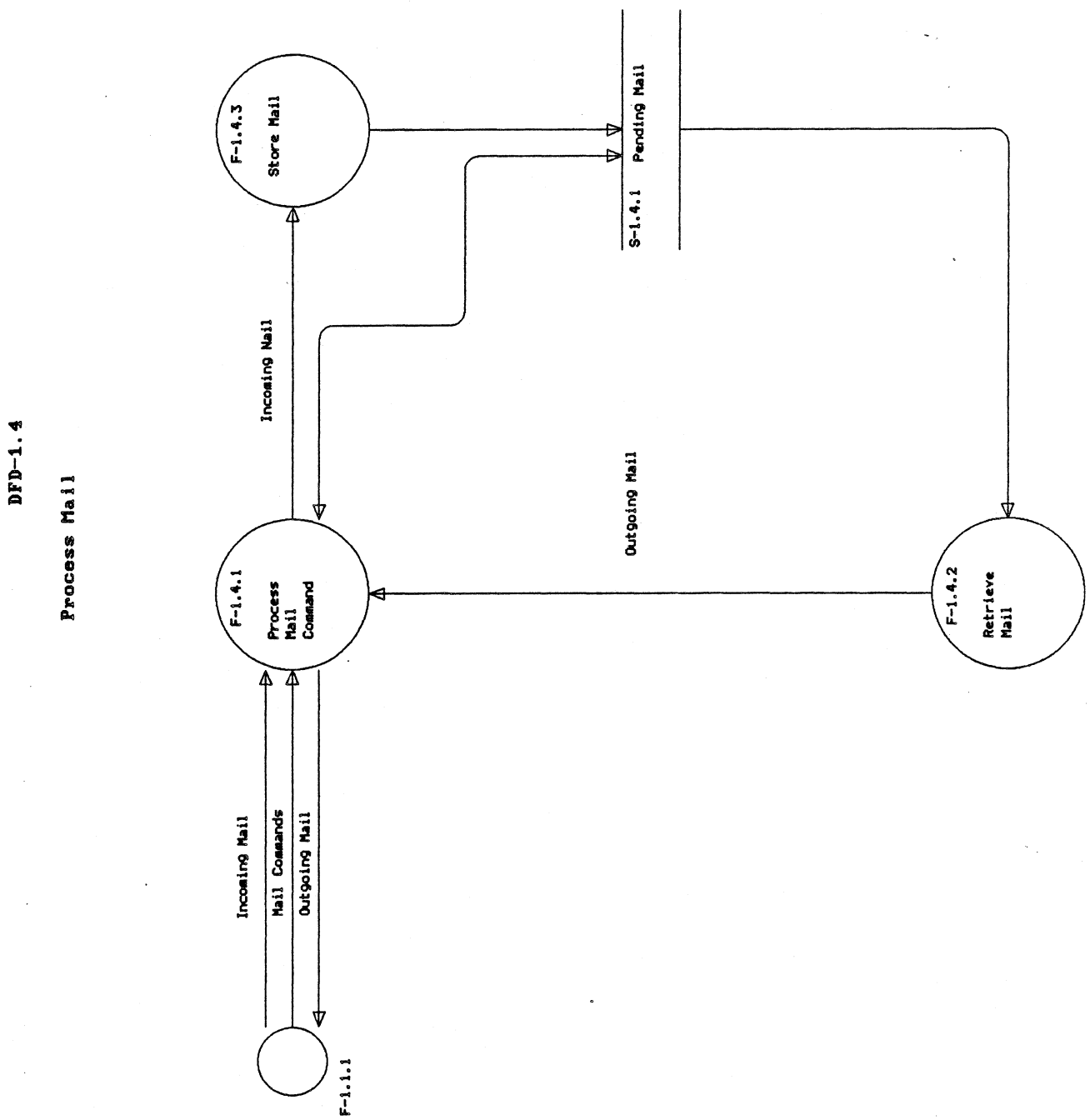
High Level User Interface



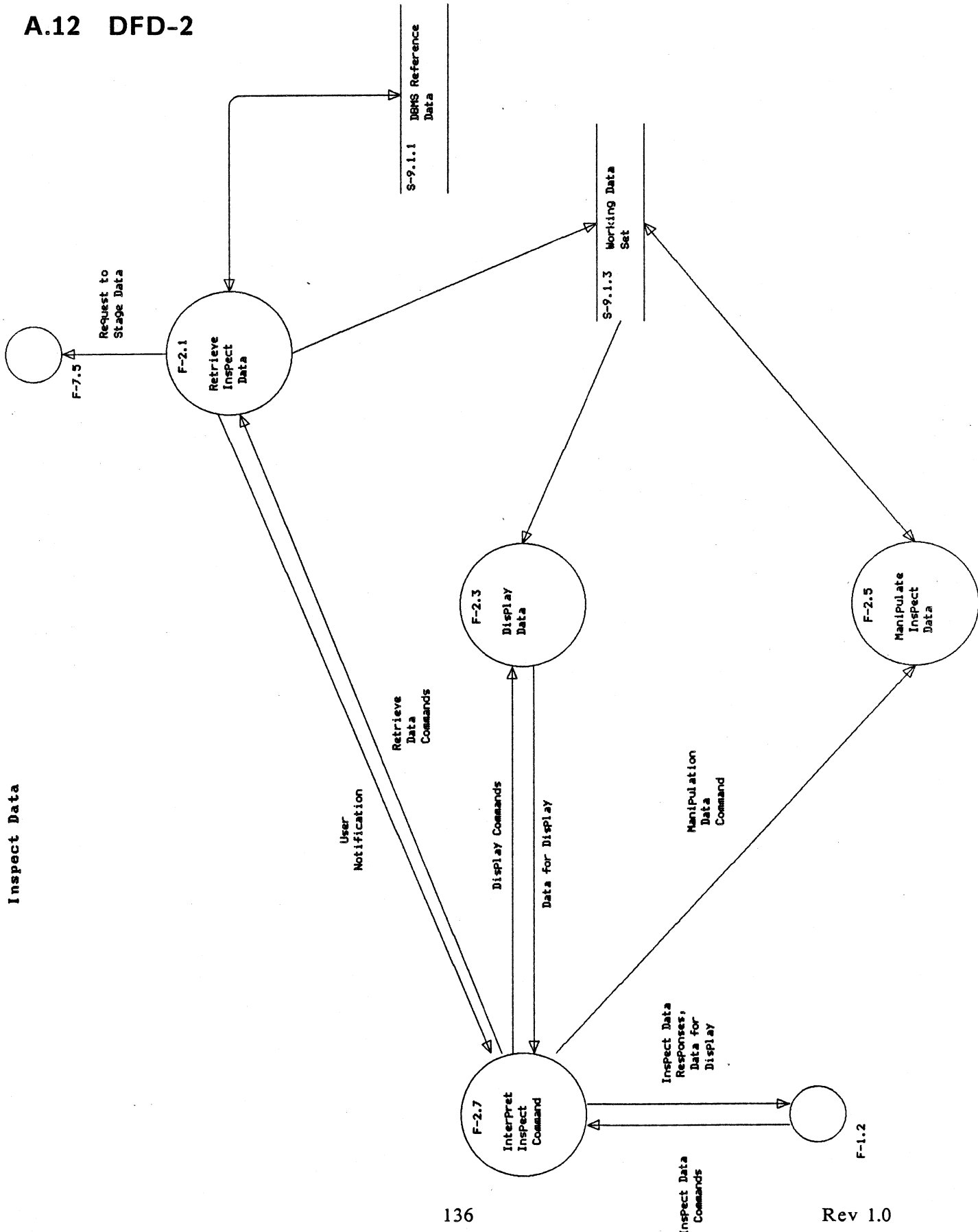
A.10 DFD-1.3


F-5.9
On line Data Distribution Requests
F-1.3.1
Control Online Data Transfers
S-9.1.1 Working Data Set
Connection Requests
Transfer Data Blocks
F-1.1.2
DFD-1.3
Transfer Data

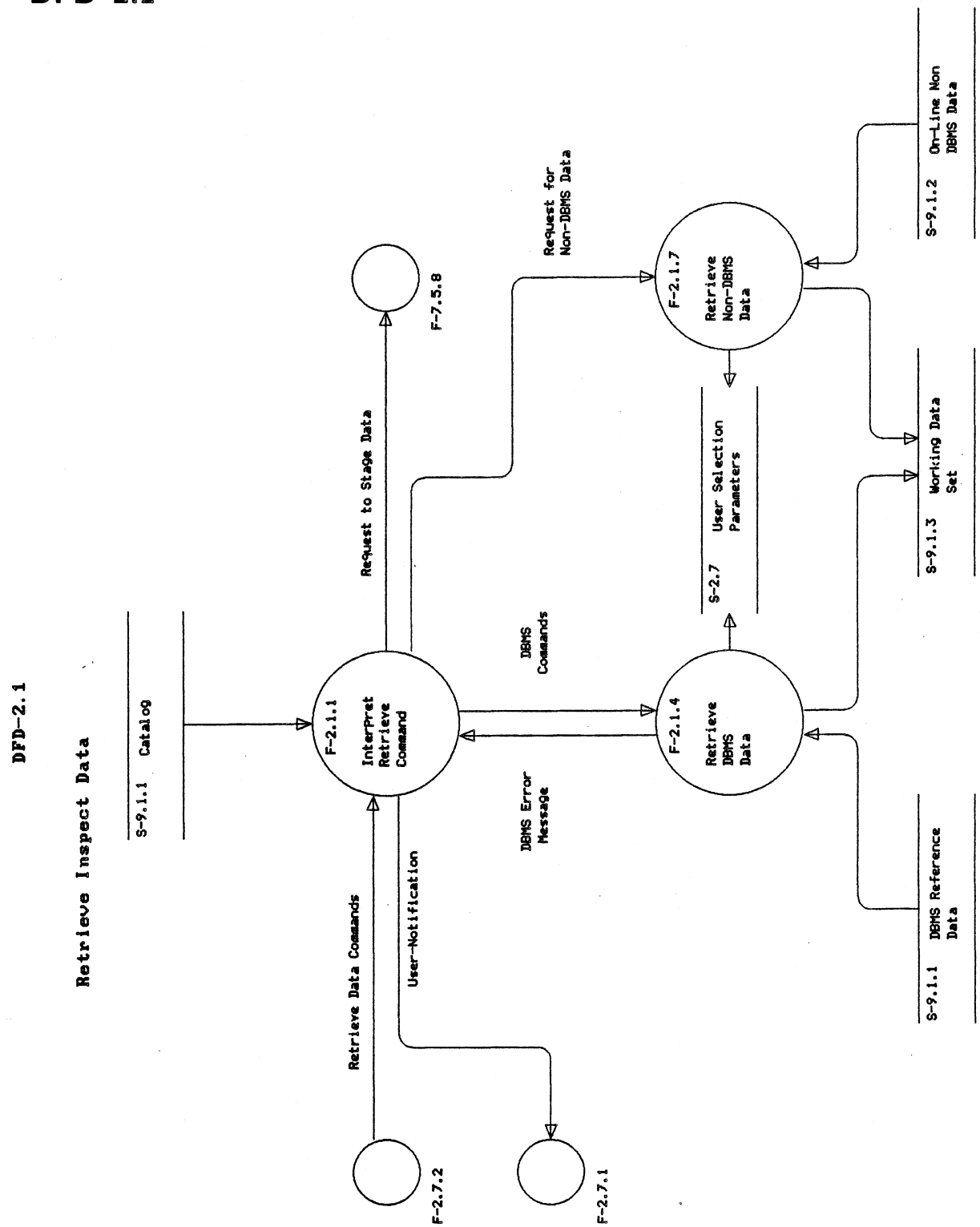
A.11 DFD-1.4


DFD-1.4
Process Mail
F-1.4.3
Store Mail
S-1.4.1
Pending Mail
Incoming Mail
Outgoing Mail
F-1.4.1
Process
Mail
Command
F-1.4.2
Retrieve
Mail
Incoming Mail
Mail Commands
Outgoing Mail
F-1.1.1

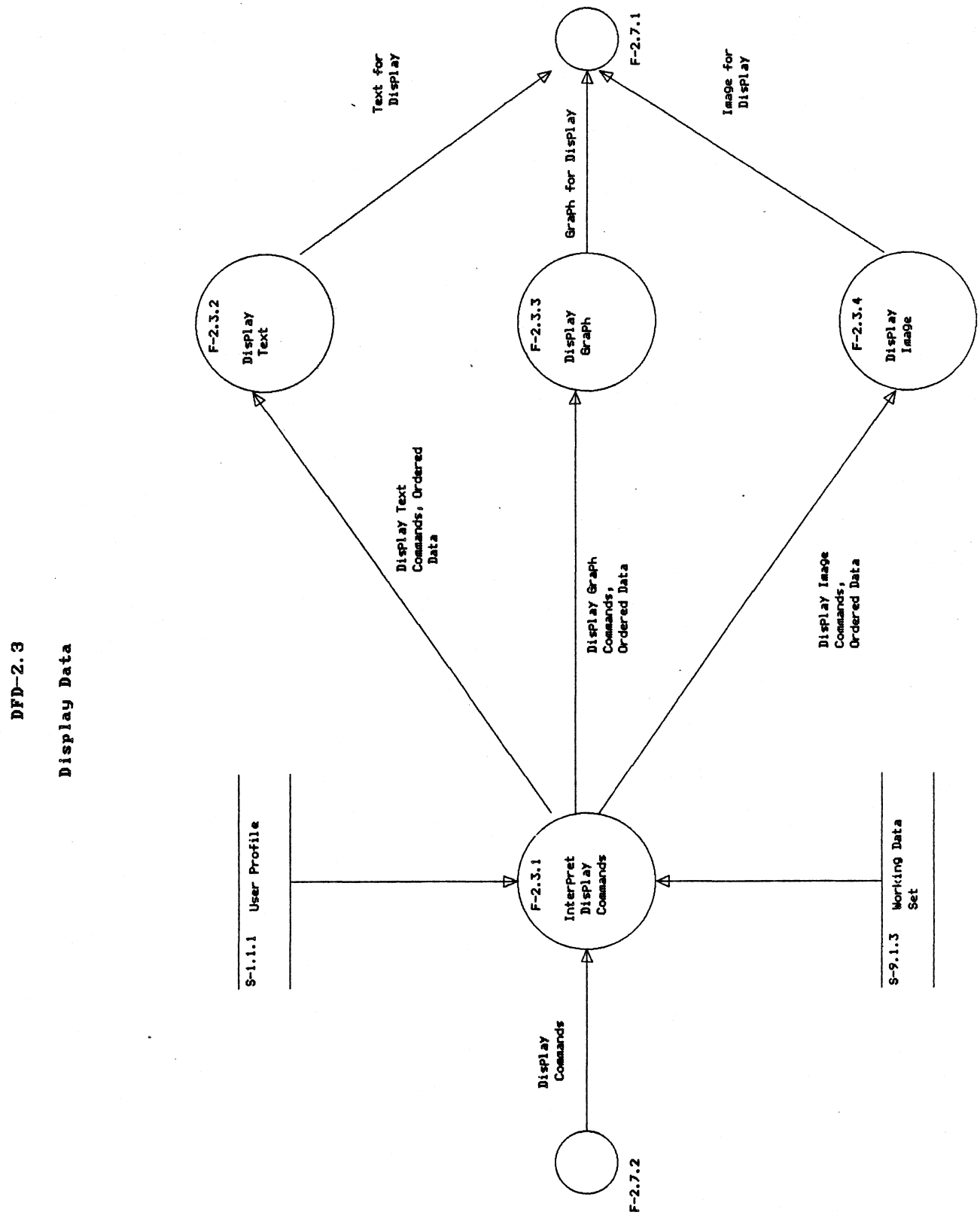
A.12 DFD-2


DFD-2
Inspect Data
S-9.1.1 DBMS Reference Data
S-9.1.3 Working Data Set
F-7.5
Request to Stage Data
F-2.1
Retrieve Inspect Data
F-2.3
DisPlaY Data
F-2.5
ManiPulate InsPect Data
F-2.7
InterPret InsPect Command
F-1.2
User Notification
Retrieve Data Commands
DisPlay Commands
Data for DisPlaY
ManiPulation Data Command
InsPect Data ResPonses; Data for DisPlay
InsPect Data Commands

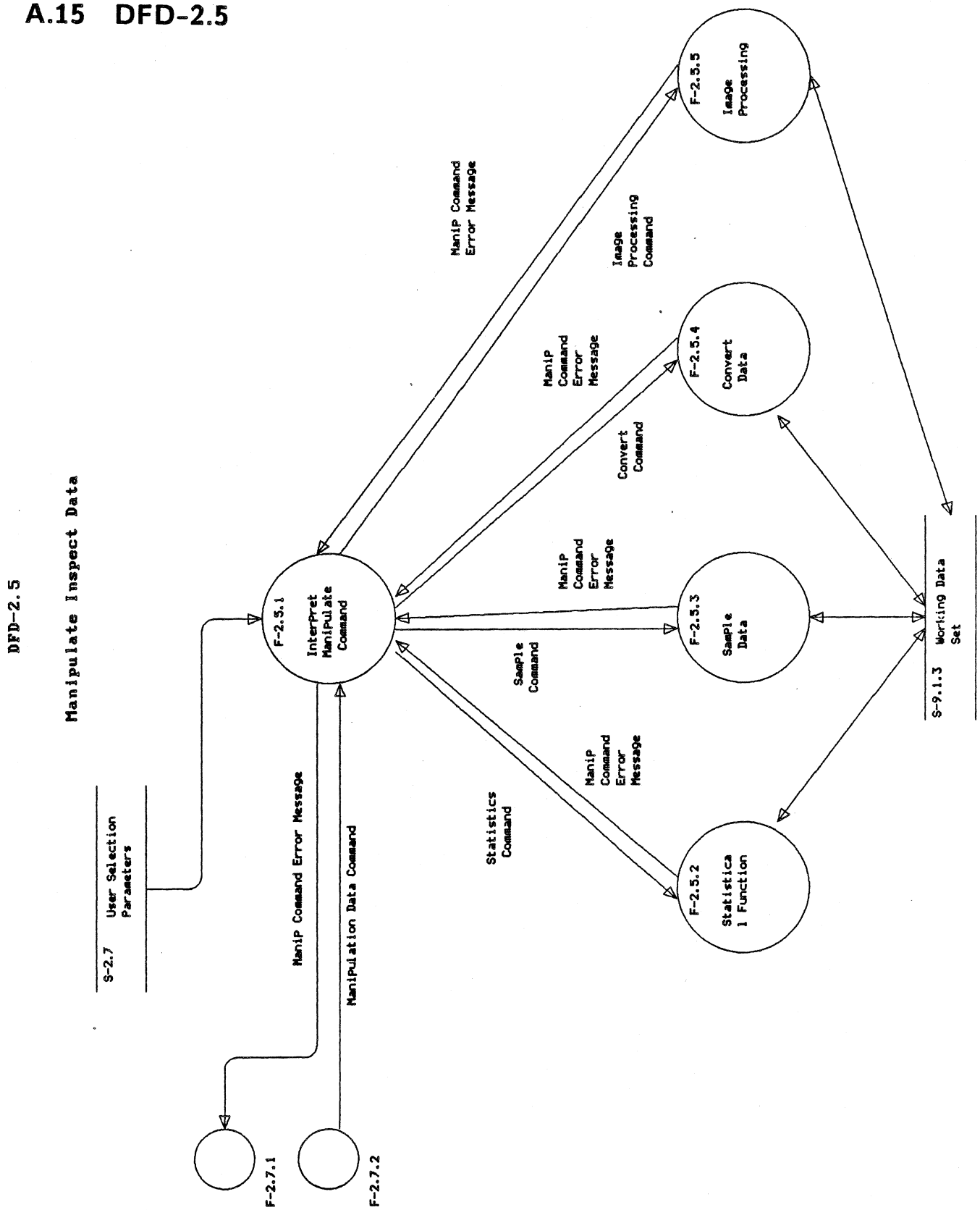
A.13 DFD-2.1


DFD-2.1
Retrieve Inspect Data
S-9.1.1 Catalog
F-2.1.1 Interpret Retrieve Command
Request to Stage Data
F-7.5.8
Request for Non-DBMS Data
F-2.1.7 Retrieve Non-DBMS Data
S-9.1.2 On-Line Non DBMS Data
S-2.7 User Selection Parameters
S-9.1.3 Working Data Set
DBMS Commands
F-2.1.4 Retrieve DBMS Data
DBMS Error Message
S-9.1.1 DBMS Reference Data
Retrieve Data Commands
User-Notification
F-2.7.2
F-2.7.1

A.14 DFD-2.3


DFD-2.3
Display Data
F-2.7.1
Text for Display
Graph for Display
Image for Display
F-2.3.2 Display Text
F-2.3.3 Display Graph
F-2.3.4 Display Image
Display Text Commands; Ordered Data
Display Graph Commands; Ordered Data
Display Image Commands; Ordered Data
S-1.1.1 User Profile
F-2.3.1 InterPret Display Commands
S-9.1.3 Working Data Set
Display Commands
F-2.7.2

A.15 DFD-2.5


DFD-2.5
Manipulate Inspect Data
S-2.7 User Selection Parameters
F-2.5.1 Interpret Manipulate Command
F-2.5.2 Statistical Function
F-2.5.3 Sample Data
F-2.5.4 Convert Data
F-2.5.5 Image Processing
S-9.1.3 Working Data Set
ManiP Command Error Message
Image Processing Command
ManiP Command Error Message
Convert Command
ManiP Command Error Message
Sample Command
ManiP Command Error Message
Statistics Command
ManiP Command Error Message
ManiPulation Data Command
F-2.7.1
F-2.7.2

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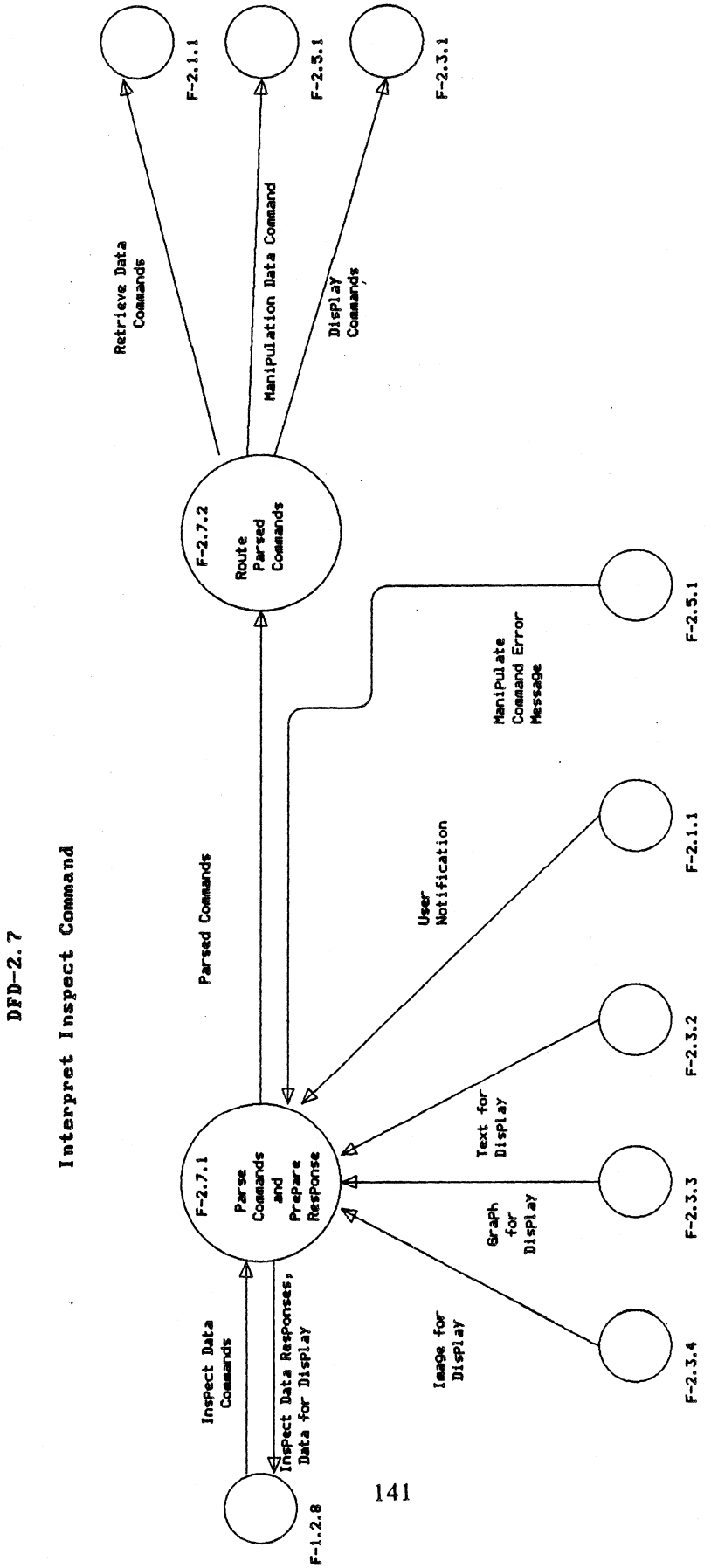
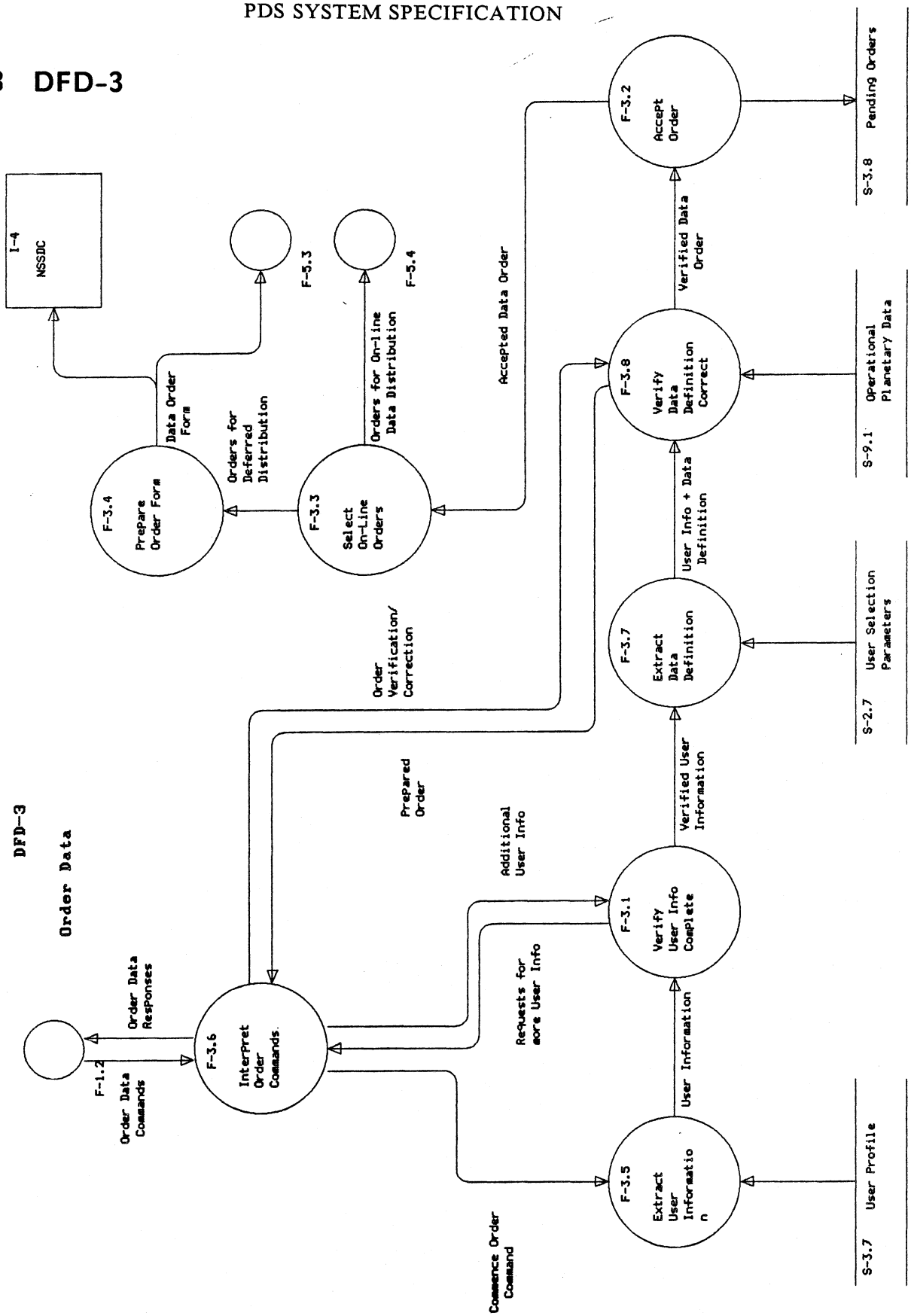
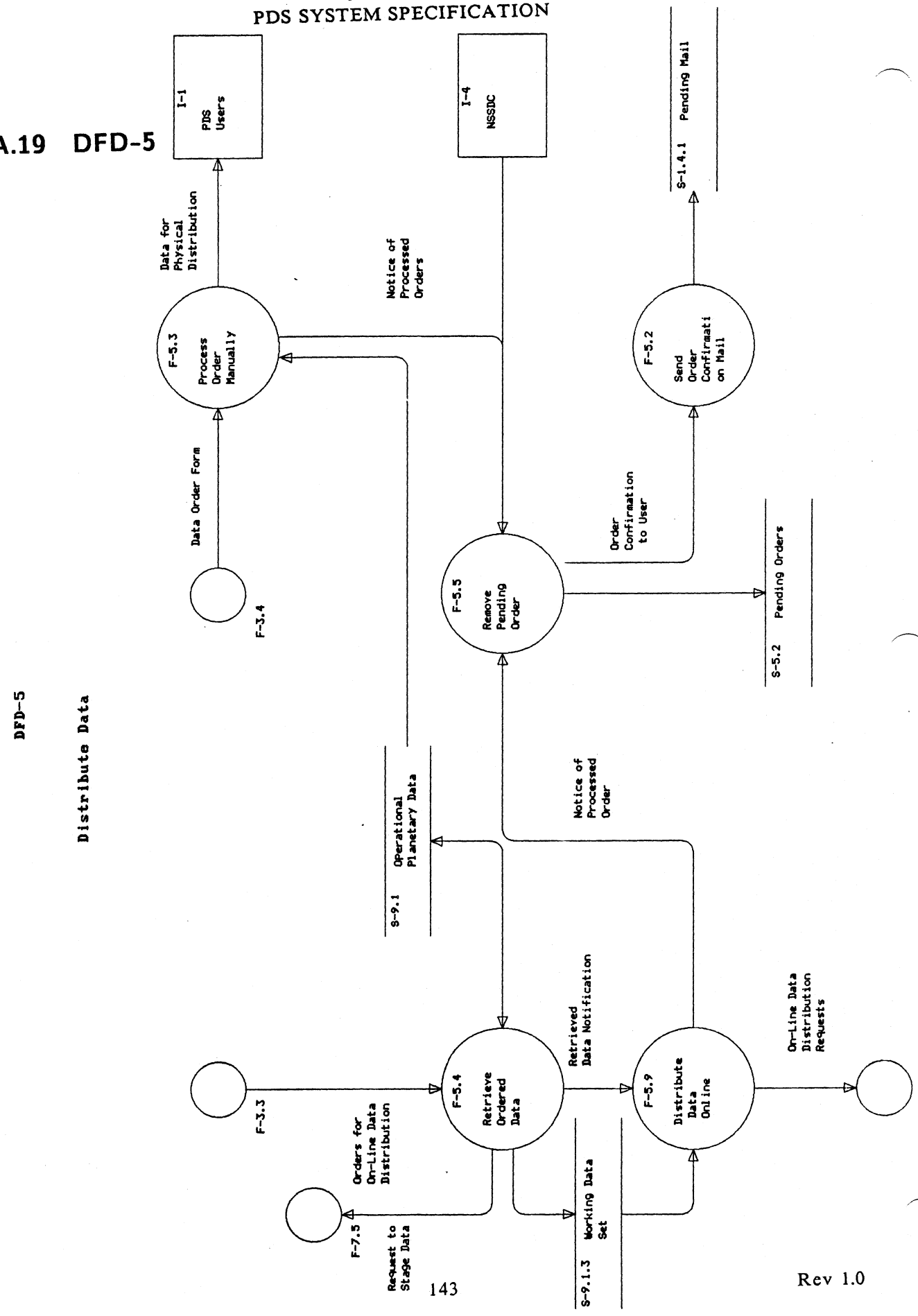
A.17 DFD-2.7


DFD-2.7
Interpret Inspect Command
F-2.1.1
F-2.5.1
F-2.3.1
Retrieve Data Commands
ManiPulation Data Command
DisPlay Commands
F-2.7.2
Route Parsed Commands
F-2.5.1
ManiPulate Command Error Message
Parsed Commands
User Notification
F-2.1.1
F-2.3.2
Text for DisPlay
F-2.7.1
Parse Commands and PrePare ResPonse
F-2.3.3
Graph for DisPlay
F-2.3.4
Image for DisPlay
InsPect Data Commands
InsPect Data ResPonses, Data for DisPlay
F-1.2.8

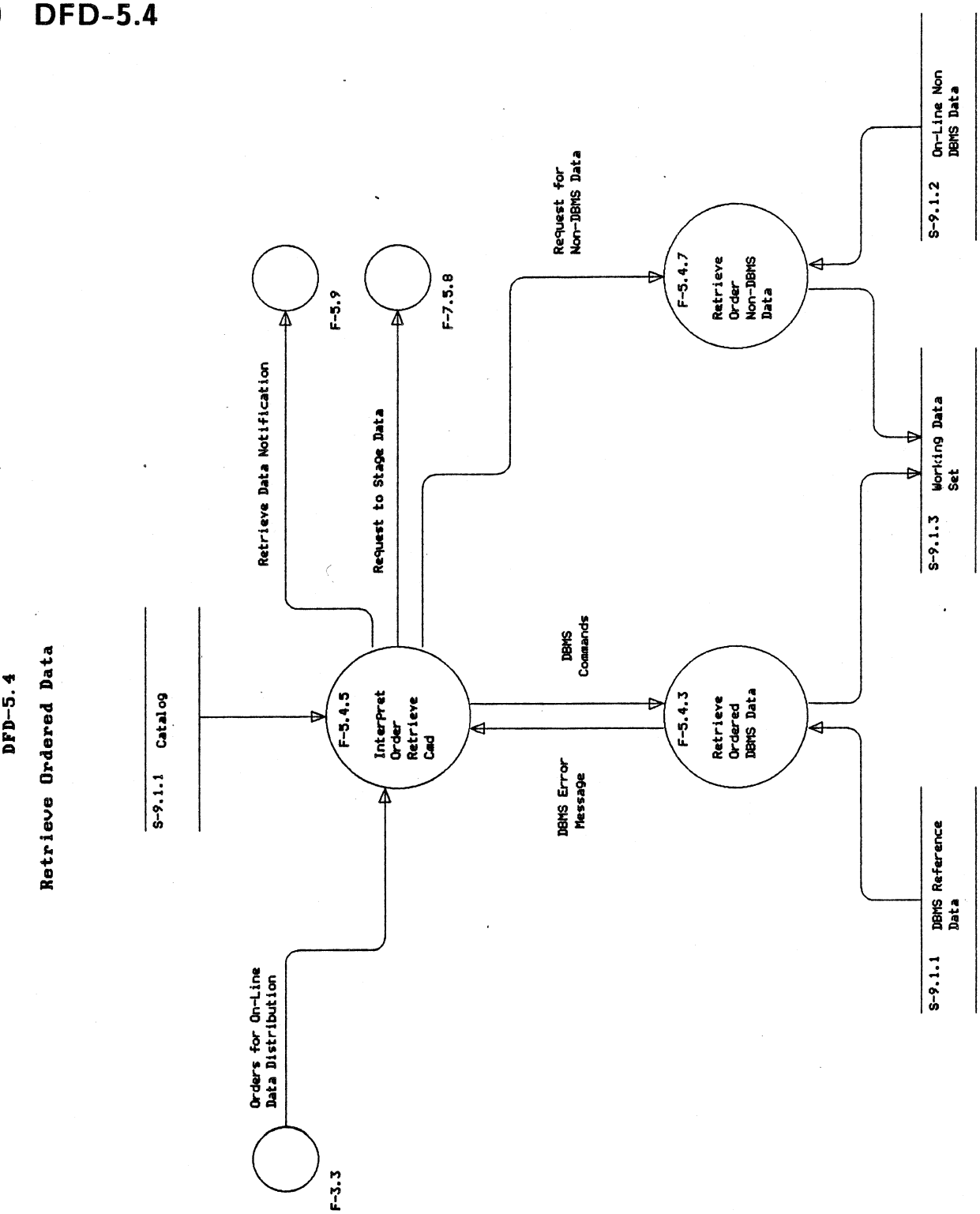
A.18 DFD-3


DFD-3
Order Data
F-1.2
Order Data Commands
Order Data Responses
F-3.6
Interpret Order Commands
Order Verification/ Correction
Prepared Order
Additional User Info
Requests for more User Info
F-3.1
Verify User Info Complete
Verified User Information
User Information
F-3.5
Extract User Information
Commence Order Command
F-3.7
Extract Data Definition
User Info + Data Definition
F-3.8
Verify Data Definition Correct
Verified Data Order
F-3.2
Accept Order
S-3.8 Pending Orders
S-9.1 Operational Planetary Data
S-2.7 User Selection Parameters
S-3.7 User Profile
Accepted Data Order
F-3.3
Select On-Line Orders
Orders for On-line Data Distribution
F-5.4
F-3.4
Prepare Order Form
Orders for Deferred Distribution
F-5.3
Data Order Form
I-4
NSSDC

A.19 DFD-5

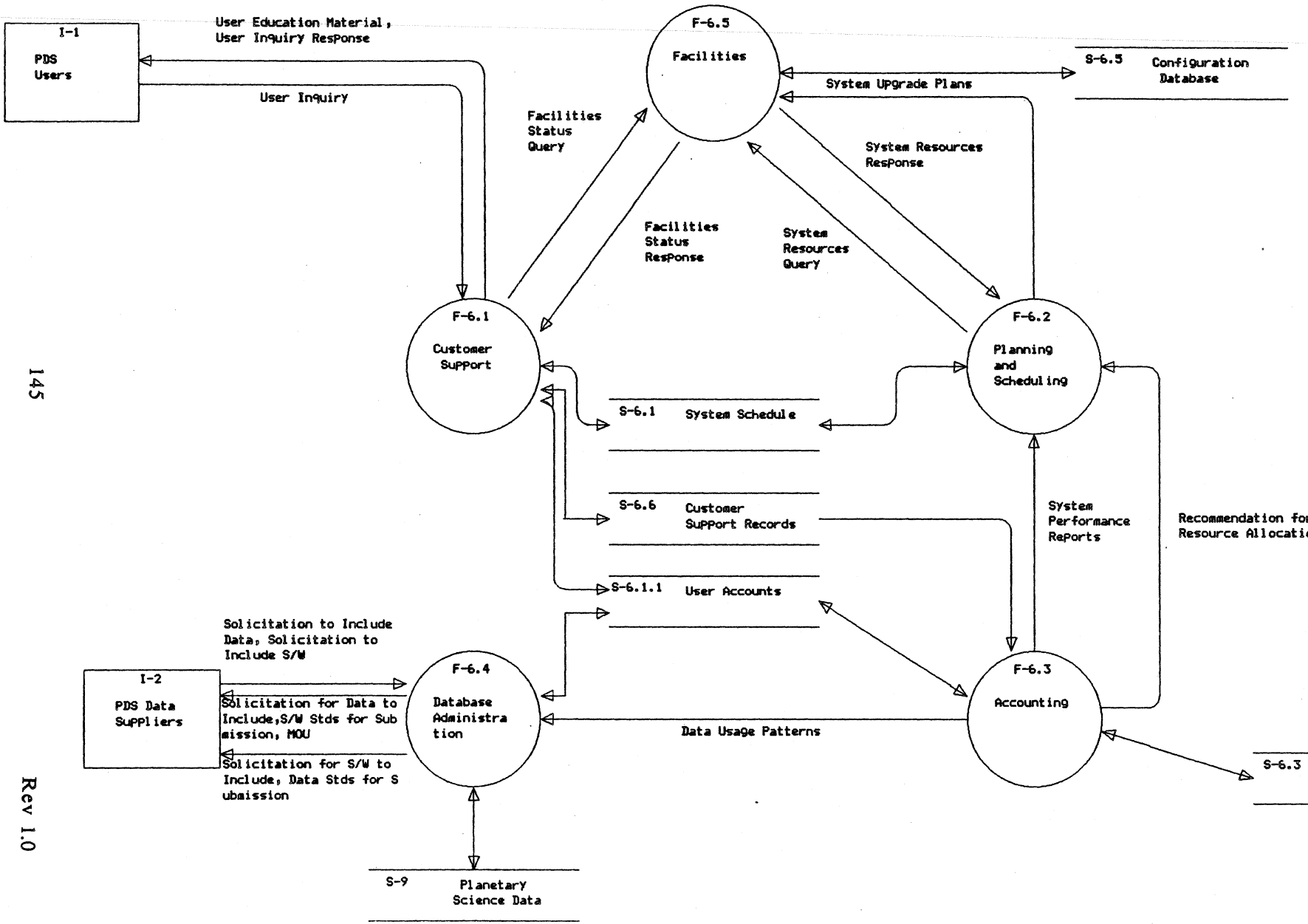

DFD-5
Distribute Data
I-1
PDS
Users
I-4
NSSDC
S-1.4.1 Pending Mail
Data for
Physical
Distribution
Notice of
Processed
Orders
F-5.3
Process
Order
Manually
F-5.2
Send
Order
Confirmati
on Mail
Data Order Form
F-3.4
Order
Confirmation
to User
F-5.5
Remove
Pending
Order
S-5.2 Pending Orders
S-9.1 Operational
Planetary Data
Notice of
Processed
Order
F-3.3
F-5.4
Retrieve
Ordered
Data
Retrieved
Data Notification
F-5.9
Distribute
Data
Online
On-Line Data
Distribution
Requests
F-1.3
Orders for
On-Line Data
Distribution
F-7.5
Request to
Stage Data
S-9.1.3 Working Data
Set

A.20 DFD-5.4


DFD-5.4
Retrieve Ordered Data
S-9.1.1 Catalog
F-3.3
Orders for On-Line Data Distribution
F-5.9
Retrieve Data Notification
F-7.5.8
Request to Stage Data
F-5.4.5 Interpret Order Retrieve Cmd
DBMS Commands
DBMS Error Message
F-5.4.3 Retrieve Ordered DBMS Data
Request for Non-DBMS Data
F-5.4.7 Retrieve Order Non-DBMS Data
S-9.1.1 DBMS Reference Data
S-9.1.3 Working Data Set
S-9.1.2 On-Line Non DBMS Data

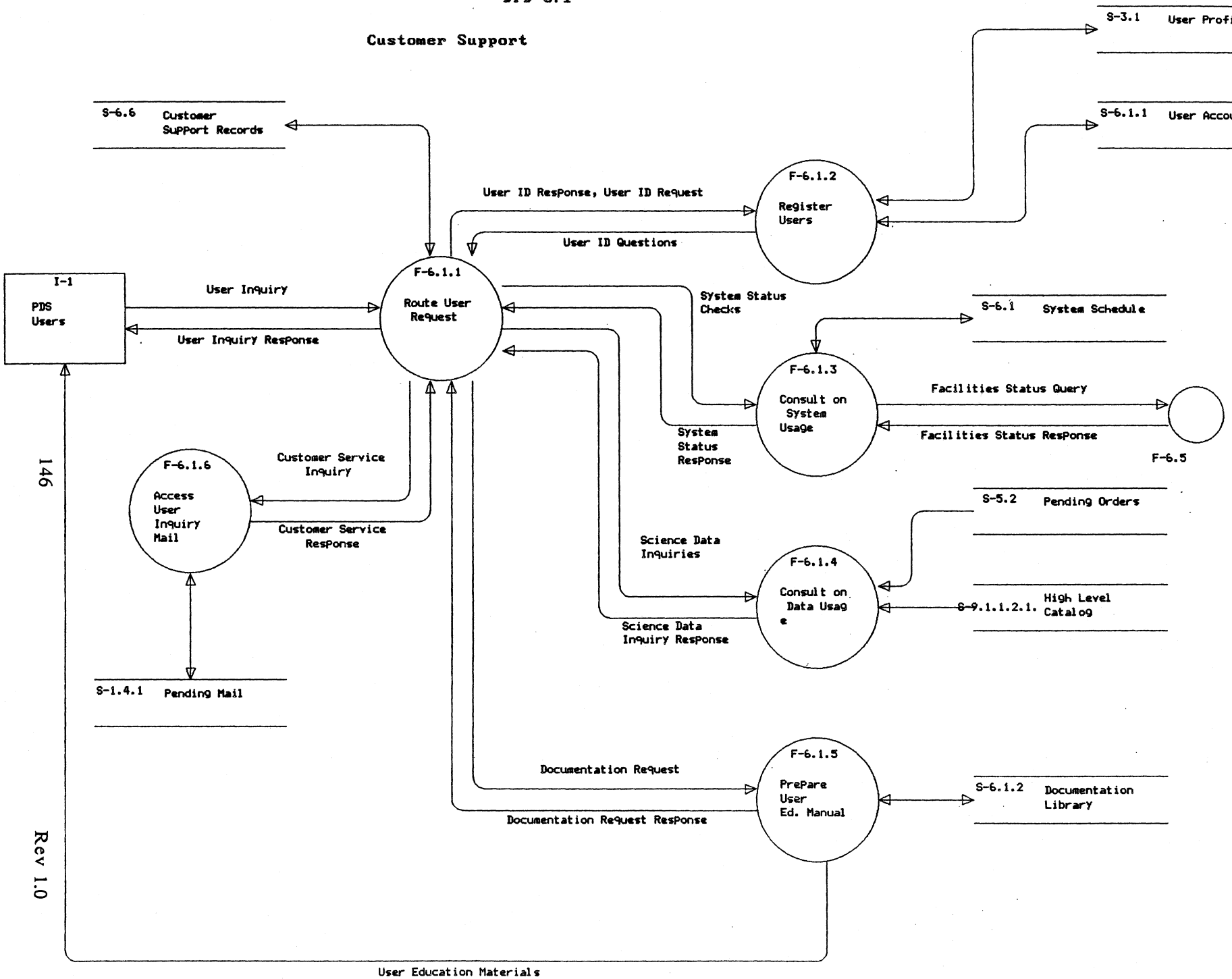
DFD-6

Administer System

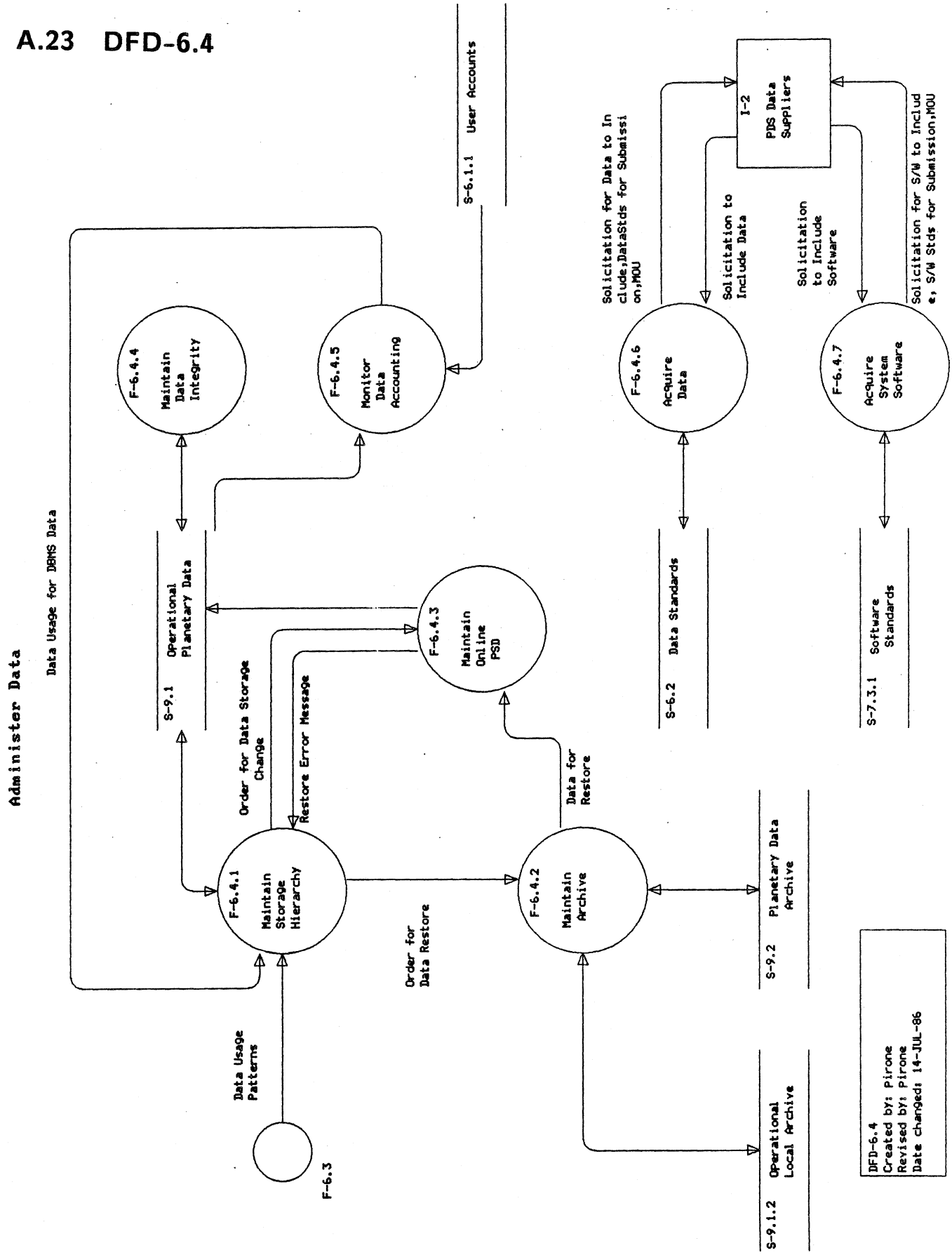


DFD-6.1

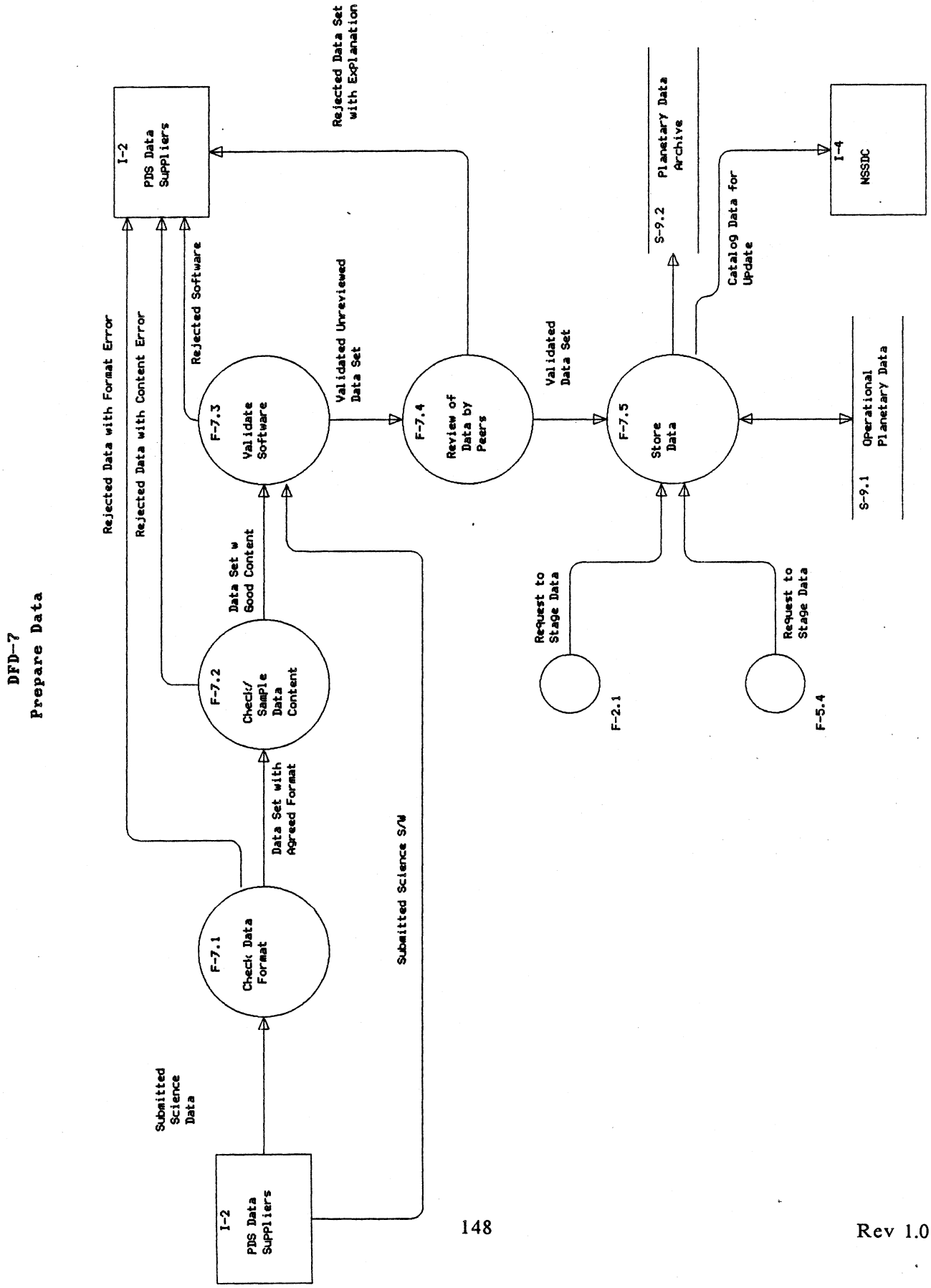
Customer Support



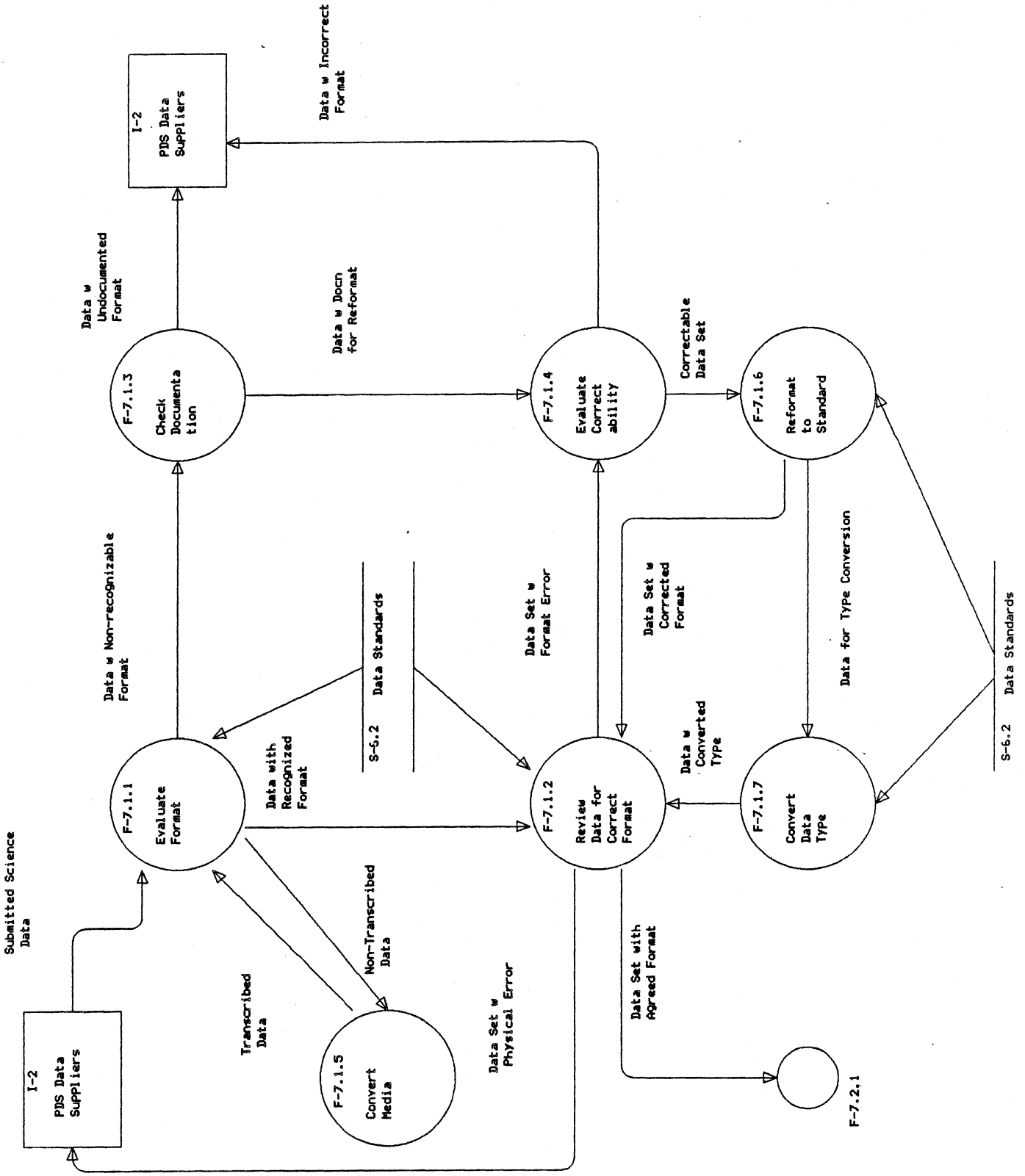
A.23 DFD-6.4


DFD-6.4
Administer Data
Data Usage for DBMS Data
S-6.1.1 User Accounts
F-6.4.4 Maintain Data Integrity
F-6.4.5 Monitor Data Accounting
S-9.1 Operational Planetary Data
F-6.4.3 Maintain Online PSD
Order for Data Storage Change
Restore Error Message
F-6.4.1 Maintain Storage Hierarchy
Data for Restore
F-6.4.2 Maintain Archive
Order for Data Restore
Data Usage Patterns
F-6.3
S-9.2 Planetary Data Archive
S-9.1.2 Operational Local Archive
Solicitation for Data to Include;DataStds for Submission;MOU
Solicitation to Include Data
F-6.4.6 Acquire Data
S-6.2 Data Standards
I-2 PDS Data Suppliers
Solicitation to Include Software
Solicitation for S/W to Include; S/W Stds for Submission;MOU
F-6.4.7 Acquire System Software
S-7.3.1 Software Standards
DFD-6.4
Created by: Pirone
Revised by: Pirone
Date changed: 14-JUL-86

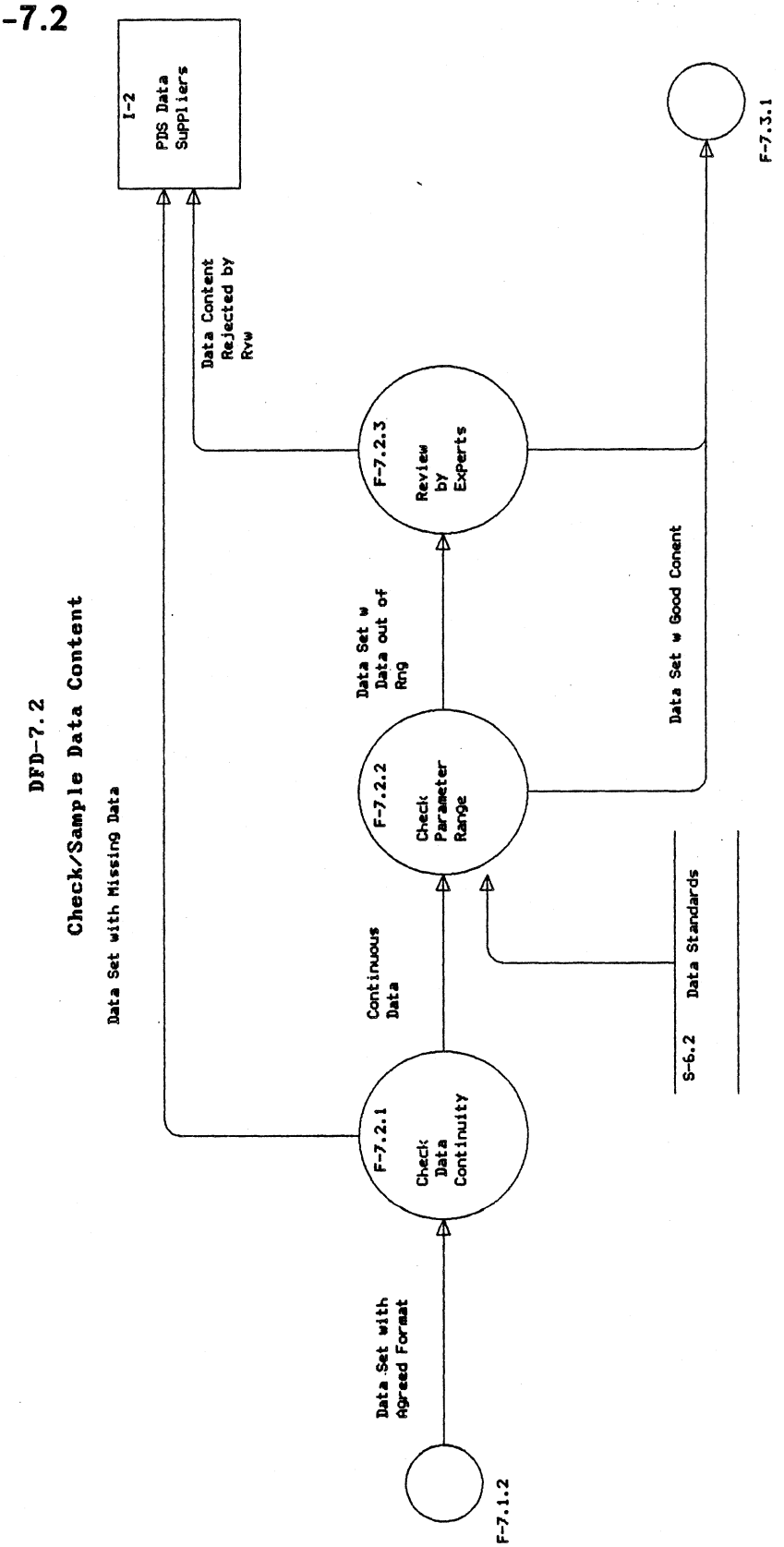
A.24 DFD-7


DFD-7
Prepare Data
I-2
PDS Data Suppliers
Submitted Science Data
F-7.1
Check Data Format
Data Set with Agreed Format
F-7.2
Check/ Sample Data Content
Data Set w Good Content
F-7.3
Validate Software
Validated Unreviewed Data Set
F-7.4
Review of Data by Peers
Validated Data Set
F-7.5
Store Data
Rejected Data with Format Error
Rejected Data with Content Error
Rejected Software
Rejected Data Set with Explanation
Submitted Science S/W
Request to Stage Data
F-2.1
Request to Stage Data
F-5.4
S-9.2 Planetary Data Archive
Catalog Data for Update
I-4
NSSDC
S-9.1 Operational Planetary Data

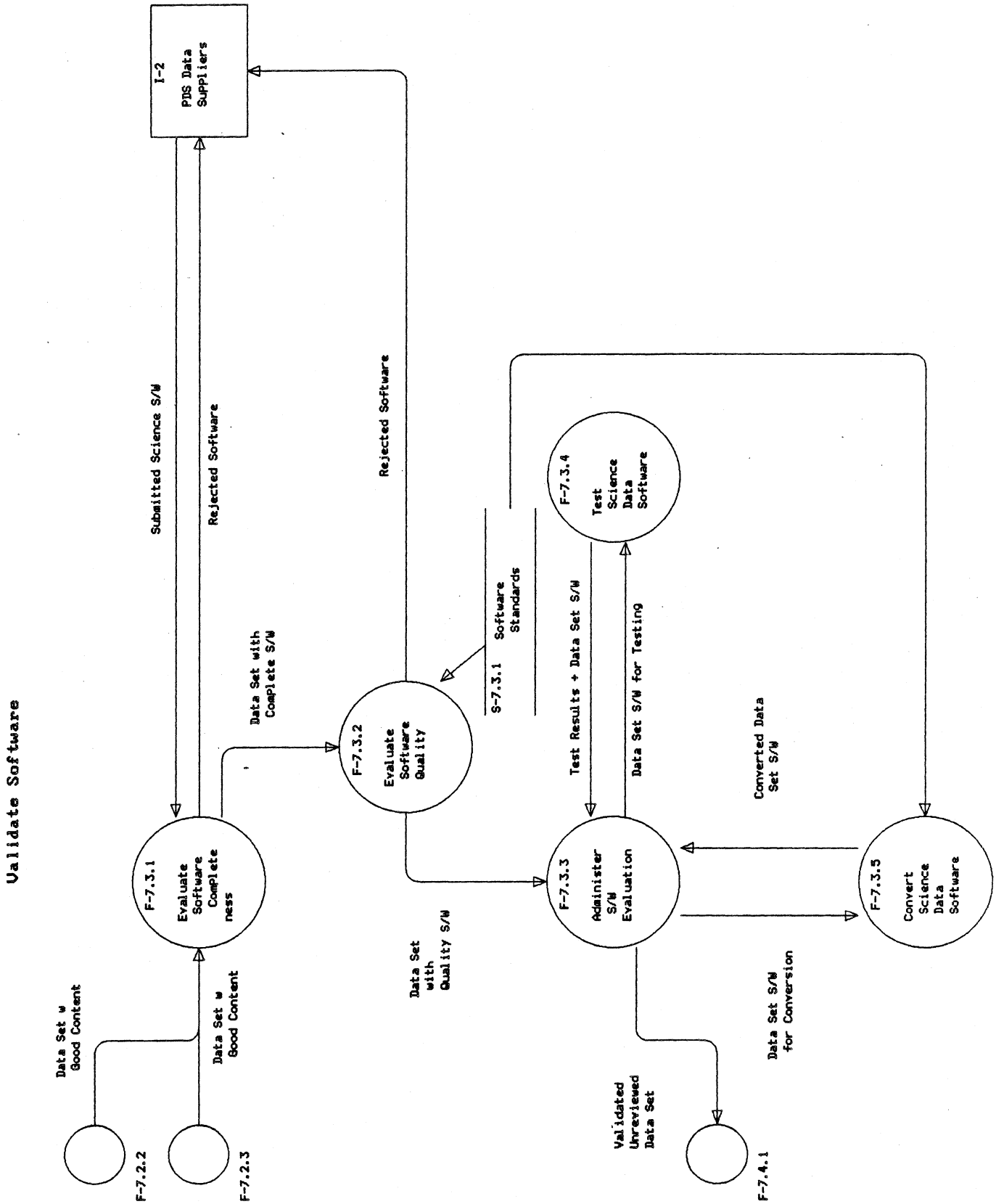
A.25 DFD-7.1


DFD-7.1
Check Format
Submitted Science Data
I-2 PDS Data Suppliers
Transcribed Data
Non-Transcribed Data
F-7.1.1 Evaluate Format
F-7.1.5 Convert Media
Data w Non-recognizable Format
Data with Recognized Format
S-6.2 Data Standards
Data Set w Physical Error
F-7.1.2 Review Data for Correct Format
Data Set w Format Error
F-7.1.3 Check Documentation
Data w Undocumented Format
I-2 PDS Data Suppliers
Data w Incorrect Format
Data w Docn for Reformat
F-7.1.4 Evaluate Correctability
Correctable Data Set
F-7.1.6 Reformat to Standard
Data Set w Corrected Format
Data w Converted Type
F-7.1.7 Convert Data Type
Data for Type Conversion
S-6.2 Data Standards
Data Set with Agreed Format
F-7.2.1

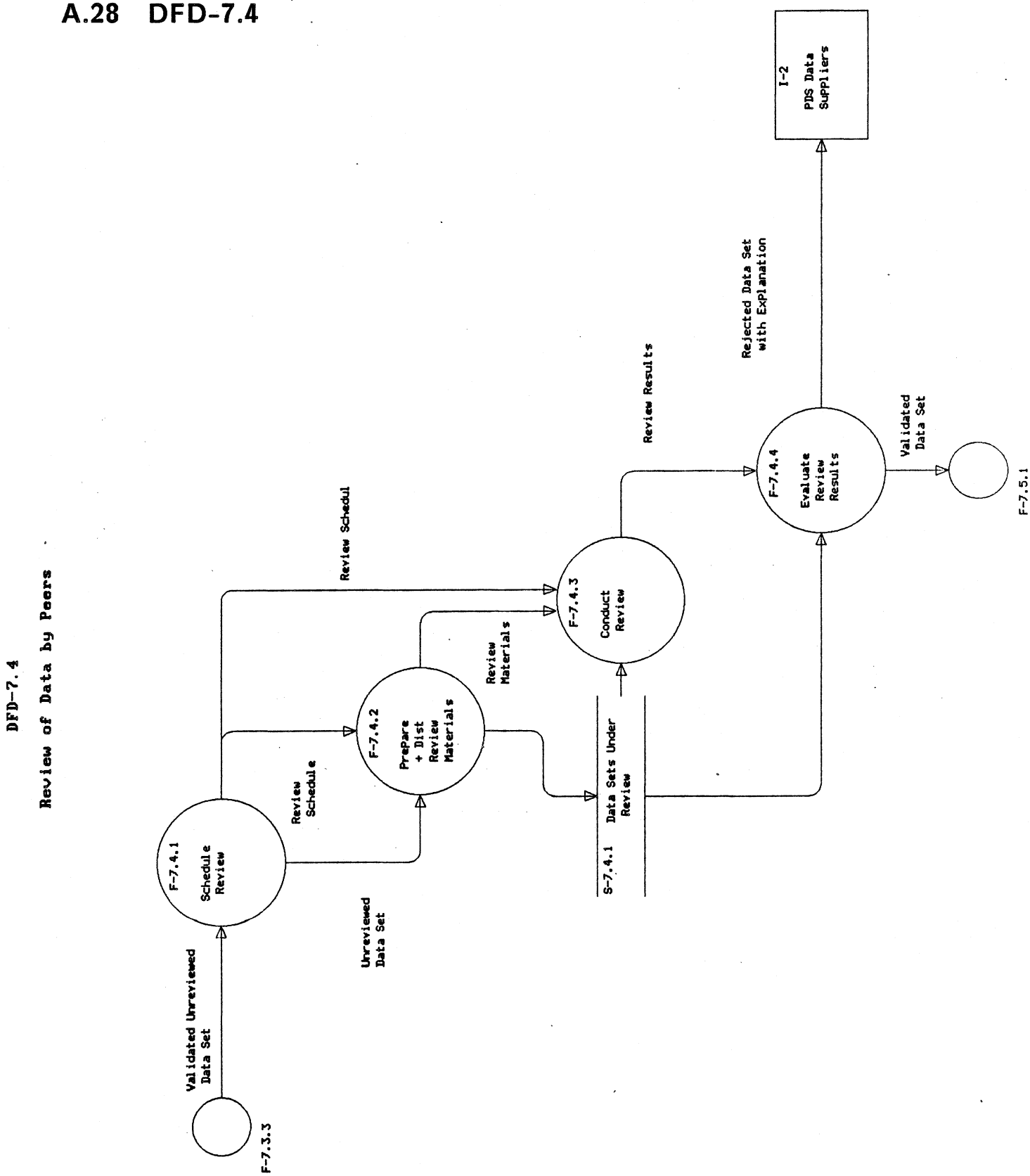
A.26 DFD-7.2


DFD-7.2
Check/Sample Data Content
I-2
PDS Data Suppliers
F-7.3.1
Data Content Rejected by Rvw
F-7.2.3
Review by Experts
Data Set w Data out of Rng
Data Set w Good Conent
F-7.2.2
Check Parameter Range
Continuous Data
S-6.2
Data Standards
Data Set with Missing Data
F-7.2.1
Check Data Continuity
Data Set with Agreed Format
F-7.1.2

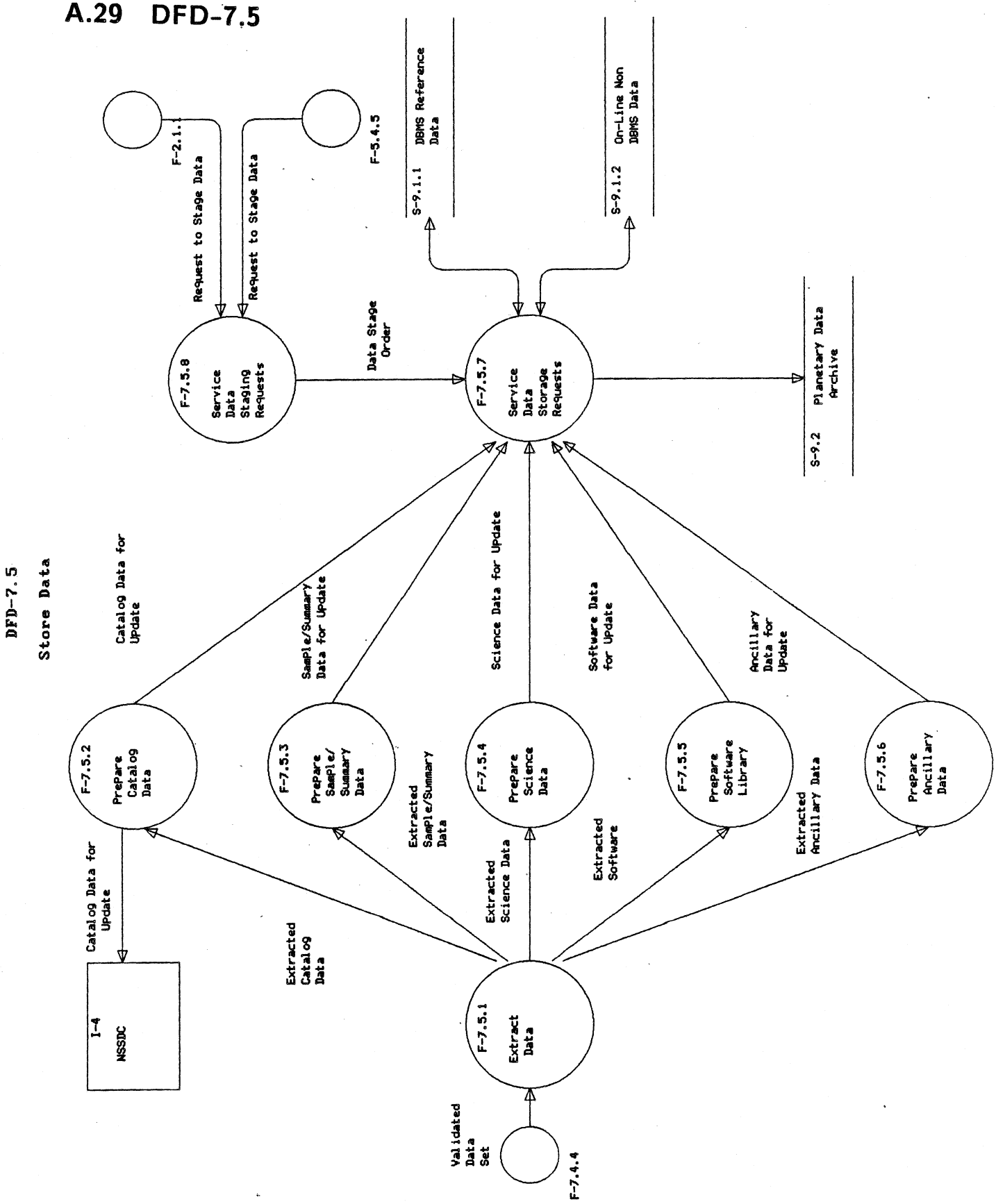
A.27 DFD-7.3


DFD-7.3
Validate Software
I-2
PDS Data Suppliers
Submitted Science S/W
Rejected Software
Rejected Software
Data Set with Complete S/W
F-7.3.1
Evaluate Software Completeness
F-7.3.2
Evaluate Software Quality
S-7.3.1
Software Standards
F-7.3.4
Test Science Data Software
Test Results + Data Set S/W
Data Set S/W for Testing
Converted Data Set S/W
F-7.3.3
Administer S/W Evaluation
F-7.3.5
Convert Science Data Software
Data Set with Quality S/W
Data Set w Good Content
Data Set w Good Content
F-7.2.2
F-7.2.3
Validated Unreviewed Data Set
Data Set S/W for Conversion
F-7.4.1

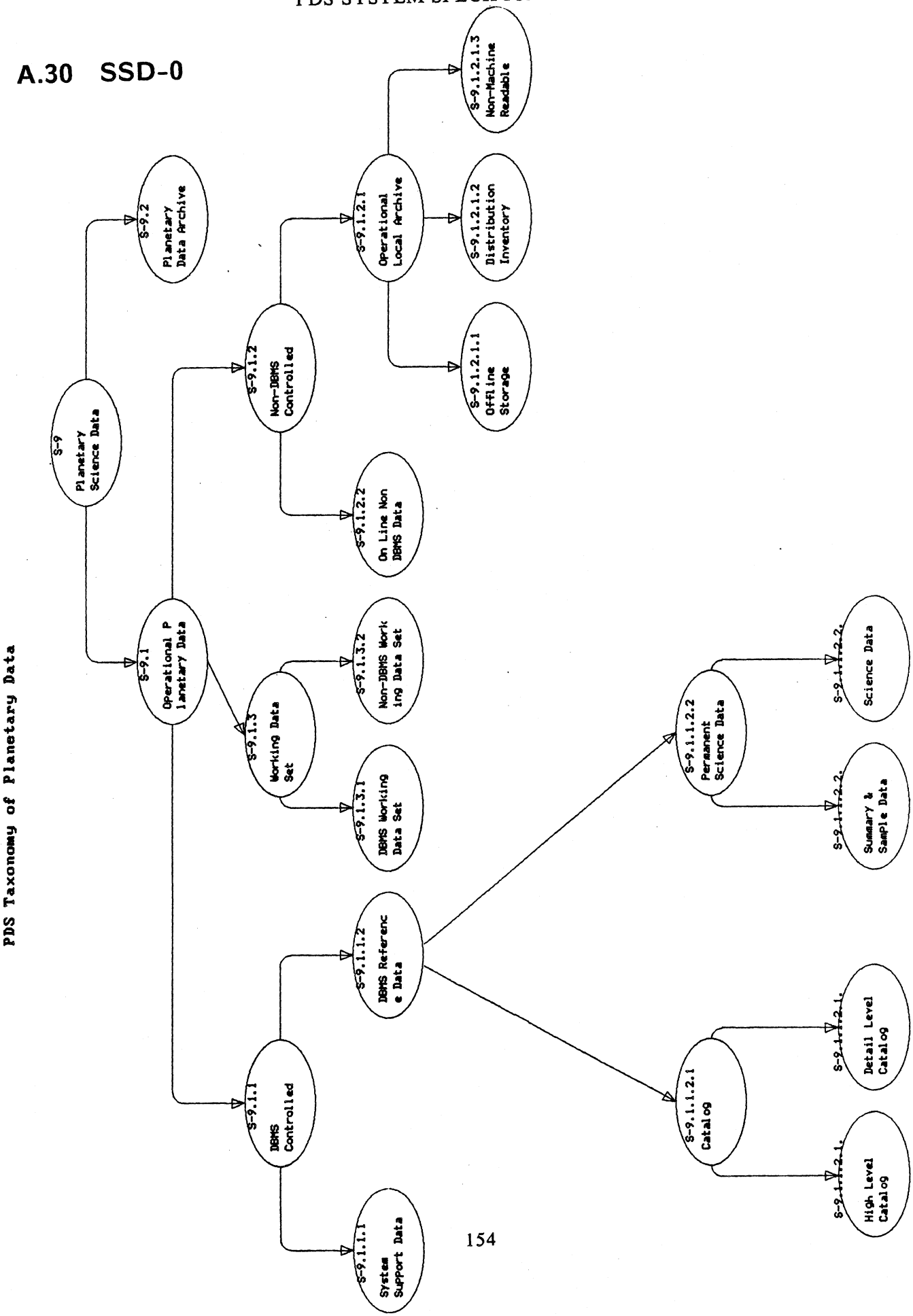
A.28 DFD-7.4


DFD-7.4
Review of Data by Peers
F-7.3.3
Validated Unreviewed Data Set
F-7.4.1
Schedule Review
Review Schedule
Unreviewed Data Set
F-7.4.2
Prepare + Dist Review Materials
Review Schedul
Review Materials
F-7.4.3
Conduct Review
S-7.4.1
Data Sets Under Review
Review Results
F-7.4.4
Evaluate Review Results
Rejected Data Set with Explanation
I-2
PDS Data Suppliers
Validated Data Set
F-7.5.1

A.29 DFD-7.5


DFD-7.5
Store Data
F-2.1.1
Request to Stage Data
F-5.4.5
Request to Stage Data
S-9.1.1 DBMS Reference Data
S-9.1.2 On-Line Non DBMS Data
F-7.5.8 Service Data Staging Requests
Data Stage Order
F-7.5.7 Service Data Storage Requests
S-9.2 Planetary Data Archive
Catalog Data for Update
Sample/Summary Data for Update
Science Data for Update
Software Data for Update
Ancillary Data for Update
F-7.5.2 Prepare Catalog Data
F-7.5.3 Prepare Sample/ Summary Data
F-7.5.4 Prepare Science Data
F-7.5.5 Prepare Software Library
F-7.5.6 Prepare Ancillary Data
Extracted Sample/Summary Data
Extracted Science Data
Extracted Software
Extracted Ancillary Data
Catalog Data for Update
I-4 NSSDC
Extracted Catalog Data
F-7.5.1 Extract Data
Validated Data Set
F-7.4.4

A.30 SSD-0


SSD-0
PDS Taxonomy of Planetary Data
S-9
Planetary Science Data
S-9.2
Planetary Data Archive
S-9.1
Operational Planetary Data
S-9.1.1
IDMS Controlled
S-9.1.1.1
System Support Data
S-9.1.1.2
IDMS Reference Data
S-9.1.1.2.1
Catalog
S-9.1.1.2.1.1
Detail Level Catalog
S-9.1.1.2.1.2
High Level Catalog
S-9.1.1.2.2
Permanent Science Data
S-9.1.1.2.2.1
Science Data
S-9.1.1.2.2.2
Summary & Sample Data
S-9.1.2
Non-IDMS Controlled
S-9.1.2.1
Operational Local Archive
S-9.1.2.1.1
Offline Storage
S-9.1.2.1.2
Distribution Inventory
S-9.1.2.1.3
Non-Machine Readable
S-9.1.2.2
On Line Non IDMS Data
S-9.1.3
Working Data Set
S-9.1.3.1
IDMS Working Data Set
S-9.1.3.2
Non-IDMS Working Data Set

B Data Dictionary

The role of the data dictionary is to define the data flows and data stores represented on the Data Flow Diagrams (A). The dictionary is organized alphabetically. Each data flow or data store is defined by the following information:

1. A textual description including references to Data Flow Diagrams where the data flow or data store appears.

2. An indented list representing the decomposition of the data flow or data store into lower-level data items. The numbers preceding each entry in these lists indicates the level of decomposition represented by that entry.

3. A list of functions which employ data for data flows or read data for data stores.

4. A list of functions which derive data for data flows or write data for data stores.

The number in parentheses following each list entry indicates the document section number where that item is described.

B.1 Accepted Data Order

An Accepted Data Order is a fully verified data order that has been reviewed by the user and has been accepted. It contains the same data items as a Verified Data Order (B.195). (Refer to Data Flow Diagrams: DFD-0, DFD-3)

Contains Data Flows:

2 Data Order Form (B.34)
2 Orders for On Line Data Distribution (B.116)

Employed by : Distribute Data (3.1.4.4)
Select On Line Orders (3.1.4.3.3)

Derived by : Order Data (3.1.4.3)
Accept Order (3.1.4.3.2)

B.2 Access Permits

Access Permits are used by the Support System Security (3.1.4.1.1.3) function to inform the Support Interactive Users (3.1.4.1.1.1) function whether the user attempting to access the system has the required privileges. If the user has entered the proper user name and password and that user is defined in the User Profile (B.191) database, then the Access Permits will be positive. If the user is not defined in the User Profile (B.191) or if the password is invalid, a negative Access Permits will be returned and access will be denied. (Refer to Data Flow Diagrams: DFD-1.1)

Employed by : Support Interactive Users (3.1.4.1.1.1)

Derived by : Support System Security (3.1.4.1.1.3)

B.3 Access Requests

Access Requests shall contain a user name and password entered by a user attempting to access the system. It is used by the Support System Security (3.1.4.1.1.3) function to validate the user's privileges. (Refer to Data Flow Diagrams: DFD-1.1)

Employed by : Support System Security (3.1.4.1.1.3)

Derived by : Support Interactive Users (3.1.4.1.1.1)

B.4 Additional User Information

The Additional User Information group shall contain a response from an interactive user who has ordered data. This response shall either verify the User Selection Parameters (B.192) stored for that user, or request changes to some or all parameters.

Additional User Information is provided in response to Requests for more User Information (B.134) when information about the user is deficient. (Refer to Data Flow Diagrams: DFD-3)

Employed by : Verify User Information Complete (3.1.4.3.1)

Derived by : Interpret Order Commands (3.1.4.3.6)

B.5 Ancillary Data for Update

This item consists of one or more files containing ancillary data extracted from the components of a data package which will be used to update the PDS data storage heirarchy. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Service Data Storage Requests (3.1.4.6.5.7)

Derived by : Prepare Ancillary Data (3.1.4.6.5.6)

B.6 Catalog

The Catalog group shall contain High Level Catalog (B.82) and Detail Level Catalog (B.62) information regarding the availability, location, and description of science and ancillary data. The Catalog shall be under DBMS control. (Refer to Data Flow Diagrams: SSD-0, DFD-2.1, DFD-5.4)

Contains Data Stores:

2 High Level Catalog (B.82)
2 Detail Level Catalog (B.62)

Read by : Interpret Order Retrieve Command (3.1.4.4.3.2)
Interpret Retrieve Command (3.1.4.2.1.1)

B.7 Catalog Data for Update

This item consists of one or more files of catalog update parameters extracted from the components of a data package which will be used to update the PDS catalog. (Refer to Data Flow Diagrams: DFD-7.5, DFD-7)

Employed by : NSSDC (3.1.6.1.1.2.2)
Service Data Storage Requests (3.1.4.6.5.7)
NSSDC (3.1.6.1.1.2.2)

Derived by : Store Data (3.1.4.6.5)
Prepare Catalog Data (3.1.4.6.5.2)

B.8 Command Help Information

This data store shall contain a hierarchical set of information about the syntax of the PDS command language. (Refer to Data Flow Diagrams: DFD-1.2)

Read by : Manage Command Help Request (3.1.4.1.2.8)

B.9 Command Help Request

If the user requires information about the syntax of the PDS command language, he shall be able to enter a Command Help Request and the Manage Command Help Request (3.1.4.1.2.8) function will return further information about the command. This request contains the command name and parameters for which help information is requested. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Manage Command Help Request (3.1.4.1.2.8)

Derived by : Interpret Command (3.1.4.1.2.4)

B.10 Command Help Response

The Command Help Response is the response to a Command Help Request (B.9). It contains descriptive information about the syntax of a specific PDS command. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Interpret Command (3.1.4.1.2.4)

Derived by : Manage Command Help Request (3.1.4.1.2.8)

B.11 Command Input

Command Input represents all requests or directives entered by the user using the PDS command syntax. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Interpret Command (3.1.4.1.2.4)

Derived by : Route Input (3.1.4.1.2.1)
Interpret Menu Input (3.1.4.1.2.3)

B.12 Command Response

Command Response generically refers to any system generated response to any PDS command entered by the system user. The response can be small (error messages) or large (data displays). The response can be textual, graphic, or image data. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Route Input (3.1.4.1.2.1)
Interpret Command (3.1.4.1.2.4)

Derived by : Interpret Command (3.1.4.1.2.4)
Communicate with Process (3.1.4.1.2.7)

B.13 Commence Order Command

The Commence Order Command shall be entered by the user to indicate he would like to order some data as described by the User Selection Parameters (B.192). (Refer to Data Flow Diagrams: DFD-3)

Employed by : Extract User Information (3.1.4.3.5)

Derived by : Interpret Order Commands (3.1.4.3.6)

B.14 Configuration Database

The Configuration Database group shall identify the hardware and software configuration items and supporting documentation and shall be utilized in systematically controlling changes to the configuration. (Refer to Data Flow Diagrams: DFD-6)

Read by : Facilities (3.1.4.5.5)

Written by : Facilities (3.1.4.5.5)

B.15 Connection Requests

A Connection Requests is issued by the Transfer Data (3.1.4.1.3) function to insure that the intended recipient of an on line data transmission is reachable over the attached network. The Connection Requests contains the identification of a network user. The Support Data Transfer Protocol (3.1.4.1.1.2) function will use this information to attempt to reach the user. (Refer to Data Flow Diagrams: DFD-1.1, DFD-1, DFD-1.3)

Employed by : Support Communications (3.1.4.1.1)
Support Data Transfer Protocol (3.1.4.1.1.2)

Derived by : Transfer Data (3.1.4.1.3)
Control On Line Data Transfers (3.1.4.1.3.1)

B.16 Continuous Data

This item consists of a science data set which has passed the data content and continuity checks and is ready for paramater range checking. (Refer to Data Flow Diagrams: DFD-7.2)

Employed by : Check Parameter Range (3.1.4.6.2.2)

Derived by : Check Data Continuity (3.1.4.6.2.1)

B.17 Convert Command

The Convert Command group shall contain an executable sequence of commands for performing basic data type conversion operations on retrieved data. (Refer to Data Flow Diagrams: DFD-2.5)

Employed by : Convert Data (3.1.4.2.3.4)

Derived by : Interpret Manipulate Command (3.1.4.2.3.1)

B.18 Converted Data Set Software

This item consists of software which has been converted to operate in the PDS environment, to another high-level programming language or to conform to PDS software standards. (Refer to Data Flow Diagrams: DFD-7.3)

Employed by : Administer Software Evaluation (3.1.4.6.3.3)

Derived by : Convert Science Data Software (3.1.4.6.3.5)

B.19 Correctable Data Set

This item consists of a data package component which has data format errors which are determined to be correctable by PDS. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Reformat to Standard (3.1.4.6.1.6)

Derived by : Evaluate Correctability (3.1.4.6.1.4)

B.20 Customer Service Inquiry

The Customer Service Inquiry group shall contain a mail message to the user in response to a user inquiry. The Customer Service Inquiry shall explain the resolution to a problem or provide status information, a request for more information on a user request, notification of a required user action, or notification of a system occurrence, etc. (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Access User Inquiry Mail (3.1.4.5.1.6)

Derived by : Route User Request (3.1.4.5.1.1)

B.21 Customer Service Response

The Customer Service Response group shall contain a mail message in response to a Customer Support request for more information about a user inquiry request. It shall also contain user inquiries which were sent by electronic mail. (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Route User Request (3.1.4.5.1.1)

Derived by : Access User Inquiry Mail (3.1.4.5.1.6)

B.22 Customer Support Records

The Customer Support Records set shall contain a log of user inquiries and requests for customer support and information regarding PDS users. It also shall include the resolution or action taken for each user inquiry, when it was taken or resolved, and by whom. (Refer to Data Flow Diagrams: DFD-6.1, DFD-6)

Read by : Accounting (3.1.4.5.3)
Customer Support (3.1.4.5.1)
Route User Request (3.1.4.5.1.1)

Written by : Customer Support (3.1.4.5.1)
Route User Request

B.23 DBMS Commands

The DBMS Commands group shall contain information necessary for the retrieval of DBMS-controlled data. The DBMS Commands shall specify the names of data fields from particular relations that a user wishes to see. The DBMS Commands shall also include a condition clause which shall specify any joins which must be made and/or any selection criteria to be appplied to the retrieval process. The condition clause may call for Boolean and/or Relational operations. (Refer to Data Flow Diagrams: DFD-5.4, DFD-2.1)

Employed by : Retrieve DBMS Data (3.1.4.2.1.2)

Derived by : Interpret Retrieve Command (3.1.4.2.1.1)
Interpret Order Retrieve Command (3.1.4.4.3.2)

B.24 DBMS Controlled

The DBMS Controlled set consists of all data files which are accessible via and maintained by the PDS data management system. Major categories of the DBMS Controlled set system support data used internally to operate the PDS and reference data, available for query and display by users. Within the reference data set are catalog data, containing meta-data or information about data, and the permanent science data, which includes complete science data files (where the data format and volume permits access via the data management system) or summary and sample data extracted from science data files. (Refer to Data Flow Diagrams: SSD-0)

Contains Data Stores:

2 System Support Data (B.173)
2 DBMS Reference Data (B.26)
3 Catalog (B.6)
4 High Level Catalog (B.82)
4 Detail Level Catalog (B.62)
3 Permanent Science Data (B.121)
4 Summary Sample Data (B.162)
4 Science Data (B.145)

B.25 DBMS Error Message

The DBMS Error Message group shall contain a message to an interactive user explaining an error in processing arising within the Retrieve DBMS Data (3.1.4.2.1.2) function. (Refer to Data Flow Diagrams: DFD-2.1, DFD-5.4)

Employed by : Interpret Retrieve Command (3.1.4.2.1.1)
Interpret Order Retrieve Command (3.1.4.4.3.2)

Derived by : Retrieve DBMS Data (3.1.4.2.1.2)

B.26 DBMS Reference Data

The DBMS Reference Data set shall contain catalog data (see Catalog (B.6)) and permanent science data, summary and sample data (see Permanent Science Data (B.121)) and ancillary data. The DBMS Reference Data shall be under DBMS control. (Refer to Data Flow Diagrams: DFD-2, DFD-7.5, DFD-5.4, SSD-0, DFD-2.1, DFD-6.4)

Contains Data Stores:

2 Catalog (B.6)
3 High Level Catalog (B.82)
3 Detail Level Catalog (B.62)
2 Permanent Science Data (B.121)
3 Summary Sample Data (B.162)
3 Science Data (B.145)

Read by :
Retrieve DBMS Data (3.1.4.2.1.2)
Retrieve Inspect Data (3.1.4.2.1)
Retrieve Ordered DBMS Data (3.1.4.4.3.1)
Service Data Storage Requests (3.1.4.6.5.7)

Written by :
Retrieve Inspect Data (3.1.4.2.1)
Service Data Storage Requests

B.27 DBMS Schema

The DBMS Schema set shall define the structure of the PDS Operational Planetary Data model. It shall include definition of the structure of all tables, the interrelationships among tables, the components of each relation or table, and the contents and type of each field or element. The DBMS Schema set shall also include user views and information on physical database features including storage, indexing, and performance enhancements.

B.28 DBMS Working Data Set

The DBMS Working Data Set shall contain data retrieved from the operational database (on or off line) in response to user requests. Data in the DBMS Working Data Set shall be available for further manipulation and processing. Whether the data resides physically or logically in the DBMS Working Data Set shall be determined during the PDS implementation phase. (Refer to Data Flow Diagrams: SSD-0)

B.29 Data and Software Agreement from Supplier

The Data and Software Agreement from Supplier group shall contain a request from PDS users, NASA Headquarters, the PSDSG, or PDS management for a particular data set or particular software to be included in the PDS. (Refer to Data Flow Diagrams: DFD-0, CSD-0)

Contains Data Flows:

2 Solicitation for Data to Include (B.152)
3 Solicitation to Include Data (B.154)
2 Solicitation for Software to Include (B.153)
3 Solicitation to Include Software (B.155)

Employed by : Planetary Data System (2)
Administer System (3.1.4.5)

Derived by : PDS Data Suppliers (3.1.6.1.1)

B.30 Data and Software Agreement from System

The Data and Software Agreement from System group shall contain a solicitation for a responsible data supplier to provide a particular data set or particular software for inclusion in PDS. It may also contain a MOU (B.89) and information concerning data and software standards. (Refer to Data Flow Diagrams: CSD-0, DFD-0)

Contains Data Flows:

2 Solicitation for Data to Include (B.152)
3 Solicitation to Include Data (B.154)
2 MOU (B.89)
2 Solicitation for Software to Include (B.153)
3 Solicitation to Include Software (B.155)
2 Software Standards for Submission (B.142)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Planetary Data System (2)
Administer System (3.1.4.5)

B.31 Data Content Rejected by Review

This item consists of a data set with errors in continuity or parameter values which is rejected by the expert review panel. (Refer to Data Flow Diagrams: DFD-7.2)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Review by Experts (3.1.4.6.2.3)

B.32 Data Files

Data Files is a generic name for any data being transmitted electronically to a user over a communication pathway in response to a data order. (Refer to Data Flow Diagrams: DFD-1.1, DFD-1)

Employed by : PDS Users (3.1.6.1.2)
Local Users ()
SPAN Users ()
Dial In Users ()

Derived by : Support Communications (3.1.4.1.1)
Support Local Users (3.1.4.1.1.4)
Support SPAN Network (3.1.4.1.1.5)
Support Dial In Users (3.1.4.1.1.6)

B.33 Data Files for On Line Distribution

Data Files for On Line Distribution is a generic name for any data being transmitted electronically to a user over a communication pathway in response to a data order. (Refer to Data Flow Diagrams: DFD-1.1, DFD-1, DFD-5, DFD-0, DFD-1.3)

Contains Data Flows:

2 Data Files (B.32)

Employed by : PDS Users (3.1.6.1.2)

Derived by : Access System (3.1.4.1)

B.34 Data Order Form

The Data Order Form is a data order as conveyed to a data node. It shall take the form of an hard copy printout or it may also be in a form capable of electronic transmission. (Refer to Data Flow Diagrams: DFD-5, DFD-3)

Employed by : Process Order Manually (3.1.4.4.2)

Derived by : Prepare Order Form (3.1.4.3.4)

B.35 Data Set Software for Conversion

This item consists of source code and related documentation which needs to be modified to operate in the PDS computing environment, to another language or to conform to PDS software standards. (Refer to Data Flow Diagrams: DFD-7.3)

Employed by : Convert Science Data Software (3.1.4.6.3.5)

Derived by : Administer Software Evaluation (3.1.4.6.3.3)

B.36 Data Set Software for Testing

This item consists of executable software modules which have been verified for completeness and quality and are ready to be tested to assure that they perform to specification. (Refer to Data Flow Diagrams: DFD-7.3)

Employed by : Test Science Data Software (3.1.4.6.3.4)

Derived by : Administer Software Evaluation (3.1.4.6.3.3)

B.37 Data Set with Corrected Format

This item consists of a data package component with a storage format which has been converted to correct format on the PDS computer. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Review Data for Correct Format (3.1.4.6.1.2)

Derived by : Reformat to Standard (3.1.4.6.1.6)

B.38 Data Set with Data out of Range

This item consists of a science data set which contains parameter values which exceed the limits defined in the PDS data dictionary or by the data set supplier. (Refer to Data Flow Diagrams: DFD-7.2)

Employed by : Review by Experts (3.1.4.6.2.3)

Derived by : Check Parameter Range (3.1.4.6.2.2)

B.39 Data Set with Format Error

This item consists of a data package component with a storage format error which may be correctible by PDS. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Evaluate Correctability (3.1.4.6.1.4)

Derived by : Review Data for Correct Format (3.1.4.6.1.2)

B.40 Data Set with Good Content

This item consists of a science data set which has passed all content, format, continuity and paramater range checks. (Refer to Data Flow Diagrams: DFD-7.3, DFD-7.2, DFD-7)

Employed by : Validate Software (3.1.4.6.3)
Evaluate Software Completeness (3.1.4.6.3.1)

Derived by : Check/ Sample Data Content (3.1.4.6.2)
Check Parameter Range (3.1.4.6.2.2)
Review by Experts (3.1.4.6.2.3)

B.41 Data Set with Physical Error

This item consists of a data package component which contains a physical input/output error so that it cannot be processed. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Review Data for Correct Format (3.1.4.6.1.2)

B.42 Data Set with Agreed Format

This item consists of a data package component which matches the format description provided by the supplier and is ready for content checking. (Refer to Data Flow Diagrams: DFD-7, DFD-7.1, DFD-7.2)

Employed by : Check/ Sample Data Content (3.1.4.6.2)
Check Data Continuity (3.1.4.6.2.1)

Derived by : Check Data Format (3.1.4.6.1)
Review Data for Correct Format (3.1.4.6.1.2)

B.43 Data Set with Complete Software

This item consists of a data package which has passed all format, content, continuity and parameter checks and with a full complement of required software components. (Refer to Data Flow Diagrams: DFD-7.3)

Employed by : Evaluate Software Quality (3.1.4.6.3.2)

Derived by : Evaluate Software Completeness (3.1.4.6.3.1)

B.44 Data Set with Missing Data

This item consists of a science data set which does not contain the data described in its documentation. (Refer to Data Flow Diagrams: DFD-7.2)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Check Data Continuity (3.1.4.6.2.1)

B.45 Data Set with Quality Software

This item consists of a data package which has passed all format, content, continuity and parameter checks and with a full complement of required software components which has passed the PDS documentation and quality standards. (Refer to Data Flow Diagrams: DFD-7.3)

Employed by : Administer Software Evaluation (3.1.4.6.3.3)

Derived by : Evaluate Software Quality (3.1.4.6.3.2)

B.46 Data Sets Under Review

This item consists of a submitted data package awaiting review by the Review of Data by Peers (3.1.4.6.4) function

Read by : Conduct Review (3.1.4.6.4.3)
Evaluate Review Results (3.1.4.6.4.4)

Written by : Prepare and Distribute Review Materials (3.1.4.6.4.2)

B.47 Data Stage Order

This item consists of a request to stage a data file from offline storage to online storage. The request must indicate the volume, directory, subdirectory and file name of the data to be staged, or alternately the tape and file number for non-integrated data sets. It must also identify the destination of the data set to be staged, and the anticipated duration of storage on that device. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Service Data Storage Requests (3.1.4.6.5.7)

Derived by : Service Data Staging Requests (3.1.4.6.5.8)

B.48 Data Standards

The Data Standards set shall contain standards for the naming, formatting, and submitting of science data to the PDS. The Data Standards set shall conform with the NASA standard format data unit specification for the registration of data set format and content descriptions. Standards for nomenclature, data types and data formats shall be consistant with standards in use by the NSSDC and SFOC. Standards for nomenclature of planetary bodies and features shall conform to the standards of the International Astronomical Union (IAU). (Refer to Data Flow Diagrams: DFD-7.1, DFD-7.2, DFD-6.4)

Read by : Acquire Data (3.1.4.5.4.6)
Check Parameter Range (3.1.4.6.2.2)
Convert Data Type (3.1.4.6.1.7)
Evaluate Format (3.1.4.6.1.1)
Reformat to Standard (3.1.4.6.1.6)
Review Data for Correct Format (3.1.4.6.1.2)

Written by : Acquire Data (3.1.4.5.4.6)

B.49 Data Standards for Submission

The Data Standards for Submission group shall include data standards information contained in the PDS Data Standards (B.48), and it shall be sent to the responsible data suppliers, to be used in preparing a data set for submittal to the PDS. (Refer to Data Flow Diagrams: DFD-6.4, DFD-6)

Employed by : PDS Data Suppliers (3.1.6.1.1)
Database Administration (3.1.4.5.4)

Derived by : Database Administration (3.1.4.5.4)
Acquire Data (3.1.4.5.4.6)
PDS Data Suppliers (3.1.6.1.1)

B.50 Data Usage Patterns

The Data Usage Patterns group shall contain information regarding data access during a given time period, indicating which data sets were accessed and the frequency of access within that time period. (Refer to Data Flow Diagrams: DFD-6, DFD-6.4)

Employed by : Database Administration (3.1.4.5.4)
Maintain Storage Hierarchy (3.1.4.5.4.1)

Derived by : Accounting (3.1.4.5.3)

B.51 Data Usage for DBMS Data

The Data Usage for DBMS Data group shall contain information concerning usage of DBMS data, and recommendations to the Maintain Storage Hierarchy (3.1.4.5.4.1) function for changes to the data storage hierarchy or for database performance tuning. (Refer to Data Flow Diagrams: DFD-6.4)

Employed by : Maintain Storage Hierarchy (3.1.4.5.4.1)

Derived by : Monitor Data Accounting (3.1.4.5.4.5)

B.52 Data for Display

The Data for Display group shall contain retrieved data to be displayed to an interactive user. The data may be in textual, graphic, or image form, as specified by the user or as determined by the Display Data (3.1.4.2.2) function. Any data held in the working data set may be displayed. (Refer to Data Flow Diagrams: DFD-2.7, DFD-1, DFD-2, DFD-0, DFD-1.2)

Contains Data Flows:

2 Text for Display (B.176)
2 Graph for Display (B.79)
2 Image for Display (B.84)

Employed by :
Access System (3.1.4.1)
Interpret Inspect Commands (3.1.4.2.4)
High Level User Interface (3.1.4.1.2)
Communicate with Process (3.1.4.1.2.7)

Derived by :
Inspect Data (3.1.4.2)
Display Data (3.1.4.2.2)
Interpret Inspect Commands (3.1.4.2.4)
Parse Command/Prepare Response (3.1.4.2.4.1)

B.53 Data for Physical Distribution

Data for Physical Distribution is a generic name for all data which is distributed to users by non electronic means. (Refer to Data Flow Diagrams: DFD-0, DFD-5, CSD-0)

Contains Data Flows:

2 Data Files for On Line Distribution (B.33)
3 Data Files (B.32)

Employed by :
PDS Users (3.1.6.1.2)

Derived by :
Planetary Data System (2)
Distribute Data (3.1.4.4)
Process Order Manually (3.1.4.4.2)

B.54 Data for Restore

The Data for Restore group shall contain data retrieved from Planetary Data Archive (B.122) to be brought on line by the Maintain Online PSD (3.1.4.5.4.3) function. (Refer to Data Flow Diagrams: DFD-6.4)

Employed by : Maintain Online PSD (3.1.4.5.4.3)

Derived by : Maintain Archive (3.1.4.5.4.2)

B.55 Data for Type Conversion

This item consists of science data sets which coontain non-standard data types which must be converted to PDS compatible data types. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Convert Data Type (3.1.4.6.1.7)

Derived by : Reformat to Standard (3.1.4.6.1.6)

B.56 Data with Converted Type

This item consists of science data sets which have had non-standard data types converted to PDS compatible data types. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Review Data for Correct Format (3.1.4.6.1.2)

Derived by : Convert Data Type (3.1.4.6.1.7)

B.57 Data with Documentation for Reformat

This item consists of a data package component which is not in the correct format for submission to PDS, but may be correctable by PDS. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Evaluate Correctability (3.1.4.6.1.4)

Derived by : Check Documentation (3.1.4.6.1.3)

B.58 Data with Incorrect Format

This item consists of a data package component which has a format error which cannot be corrected by PDS. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Evaluate Correctability (3.1.4.6.1.4)

B.59 Data with Non Recognizable Format

This item consists of a data package component in a format which cannot be recognized and processed on the PDS computer. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Check Documentation (3.1.4.6.1.3)

Derived by : Evaluate Format (3.1.4.6.1.1)

B.60 Data with Undocumented Format

This item consists of a data package component with an unrecognizable format which cannot be deciphered with the existing documentation accompanying the data package. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Check Documentation (3.1.4.6.1.3)

B.61 Data with Recognized Format

This item consists of a data package component with a storage format which can be recognized and processed on the PDS computer. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Review Data for Correct Format (3.1.4.6.1.2)

Derived by : Evaluate Format (3.1.4.6.1.1)

B.62 Detail Level Catalog

The Detail Level Catalog set shall contain detail-level data catalog information describing the science and ancillary data and explaining where to order the data. (Refer to Data Flow Diagrams: SSD-0)

B.63 Display Commands

The Display Commands group shall contain a parsed, complete, and valid command for displaying retrieved data in textual, graphic, or image form. (Refer to Data Flow Diagrams: DFD-2.7, DFD-2, DFD-2.3)

Employed by : Display Data (3.1.4.2.2)
Interpret Display Command (3.1.4.2.2.1)

Derived by : Interpret Inspect Commands (3.1.4.2.4)
Route Parsed Commands (3.1.4.2.4.2)

B.64 Display Graph Commands

The Display Graph Commands group shall contain executable commands for displaying retrieved data in graphic form. The capability shall exist to produce X-Y plots, bar charts, and pseudo three-dimensional displays. The Display Graph Commands may contain user-specified graphic output formatting information. (Refer to Data Flow Diagrams: DFD-2.3)

Employed by : Display Graph (3.1.4.2.2.3)

Derived by : Interpret Display Command (3.1.4.2.2.1)

B.65 Display Image Commands

The Display Image Commands group shall contain executable commands for displaying retrieved image data. (Refer to Data Flow Diagrams: DFD-2.3)

Employed by : Display Image (3.1.4.2.2.4)

Derived by : Interpret Display Command (3.1.4.2.2.1)

B.66 Display Text Commands

The Display Text Commands group shall contain executable commands for displaying retrieved data in ASCII text form in either report or column listing form. (Refer to Data Flow Diagrams: DFD-2.3)

Employed by : Display Text (3.1.4.2.2.2)

Derived by : Interpret Display Command (3.1.4.2.2.1)

B.67 Distribution Inventory

The Distribution Inventory consists of data sets ready for distribution. (Refer to Data Flow Diagrams: SSD-0)

B.68 Documentation Library

The Documentation Library set shall contain the master copy of all PDS documentation including system documentation, maintenance and operation manuals, DA and DBA procedures and guidelines, software documentation, instrument and data set documentation, User's Manuals, and other user educational material. (Refer to Data Flow Diagrams: DFD-6.1)

Read by : Prepare User Education Manual (3.1.4.5.1.5)

Written by : Prepare User Education Manual (3.1.4.5.1.5)

B.69 Documentation Request

The Documentation Request group shall contain a user request for documentation. Most often this request shall be for user manuals, education materials or documentation on instruments and data sets. However, selected users could request and receive system documentation as well. (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Prepare User Education Manual (3.1.4.5.1.5)

Derived by : Route User Request (3.1.4.5.1.1)

B.70 Documentation Request Response

The Documentation Request Response group provides system documentation and user educational materials in response to a user Documentation Request (B.69). (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Route User Request (3.1.4.5.1.1)

Derived by : Prepare User Education Manual (3.1.4.5.1.5)

B.71 Extracted Ancillary Data

This item consists of one or more files containing ancillary data extracted from the components of a data package which will be used to update the PDS data storage heirarchy. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Prepare Ancillary Data (3.1.4.6.5.6)

Derived by : Extract Data (3.1.4.6.5.1)

B.72 Extracted Catalog Data

This item consists of one or more files of catalog update parameters extracted from the components of a data package which will be used to update the PDS catalog. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Prepare Catalog Data (3.1.4.6.5.2)

Derived by : Extract Data (3.1.4.6.5.1)

B.73 Extracted Sample/Summary Data

This item consists of one or more files containing sample/summary data extracted from the components of a data package which will be used to update the PDS data storage heirarchy. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Prepare Sample/ Summary Data (3.1.4.6.5.3)

Derived by : Extract Data (3.1.4.6.5.1)

B.74 Extracted Science Data

This item consists of one or more files containing science data extracted from the components of a data package which will be used to update the PDS data storage heirarchy. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Prepare Science Data (3.1.4.6.5.4)

Derived by : Extract Data (3.1.4.6.5.1)

B.75 Extracted Software

This item consists of one or more files containing source or executable routines or software libraries extracted from the components of a data package which will be used to update the PDS data storage heirarchy. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Prepare Software Library (3.1.4.6.5.5)

Derived by : Extract Data (3.1.4.6.5.1)

B.76 Facilities Status Query

The Facilities Status Query group shall contain a query concerning the operational status and capacities of the hardware and software configuration items. (Refer to Data Flow Diagrams: DFD-6.1, DFD-6)

Employed by : Facilities (3.1.4.5.5)

Derived by : Customer Support (3.1.4.5.1)
Consult on System Usage (3.1.4.5.1.3)

B.77 Facilities Status Response

The Facilities Status Response group shall contain information on the operational status and capacities of the hardware and software configuration items in response to a Facilities Status Query (B.76). (Refer to Data Flow Diagrams: DFD-6.1, DFD-6)

Employed by : Customer Support (3.1.4.5.1)
Consult on System Usage (3.1.4.5.1.3)

Derived by : Facilities (3.1.4.5.5)

B.78 Formulate Order Command

The Formulate Order Command group shall contain a parsed, complete, and valid command for the formulation of an order for data, based on the results of the inspect operations performed by a user during a data inspection session. The command may include the specification of additional standard data manipulation and transformations to be applied to the data before its delivery to the user. (Refer to Data Flow Diagrams: DFD-2.7, DFD-2, DFD-2.6)

B.79 Graph for Display

The Graph for Display group shall contain retrieved data in graphic form to be displayed to an interactive user. The data shall be in one of several forms, as follows:

1) X-Y plots of values of one parameter against values of a second parameter, or of two one-dimension arrays plotted against each other.

2) Bar charts for displaying histograms.

3) Pseudo three-dimensional displays in the form of contour plots and 3-D surface plots.

This data shall be passed only to interactive users who are using PDS-supported graphic or image display devices. (Refer to Data Flow Diagrams: DFD-2.7, DFD-2.3)

Employed by : Parse Command/Prepare Response (3.1.4.2.4.1)

Derived by : Display Graph (3.1.4.2.2.3)

B.80 Help Request

A Help Request is a command from the user requesting the PDS to explain further some detail of the operation of the system. Specifically, the Help Request will be used by the user to request information on command syntax and menu operation. A Help Request shall contain a topic which is to be explained. Since the help information is hierarchical in organization, any Help Request may contain a partial topic name. In this case, the missing parts of the topic name shall be assumed to be higher in the hierarchy and need to have been entered by prior Help Requests. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Manage Menu (3.1.4.1.2.2)

Derived by : Route Input (3.1.4.1.2.1)
Interpret Menu Input (3.1.4.1.2.3)

B.81 Help Response

A Help Response is a response to a Help Request (B.80). It contains explanation about the topic specified in the Help-Request. All Help Responses originate as data in the Command Help Information (B.8) and Menu Information (B.94) data stores. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Route Input (3.1.4.1.2.1)
Interpret Menu Input (3.1.4.1.2.3)

Derived by : Manage Menu (3.1.4.1.2.2)

B.82 High Level Catalog

The High Level Catalog set shall contain high level data catalog information regarding the availability and location of science and ancillary data. The High Level Catalog shall be under DBMS control. (Refer to Data Flow Diagrams: SSD-0, DFD-6.1)

Read by : Consult on Data Usage (3.1.4.5.1.4)

B.83 Image Processing Command

The Image Processing Command group shall contain an executable sequence of commands for performing elementary image processing functions on retrieved image data. (Refer to Data Flow Diagrams: DFD-2.5)

Employed by : Image Processing (3.1.4.2.3.5)

Derived by : Interpret Manipulate Command (3.1.4.2.3.1)

B.84 Image for Display

The Image for Display group shall contain retrieved data in image form to be displayed to an interactive user who is using a PDS-supported graphic or image display device. (Refer to Data Flow Diagrams: DFD-2.7, DFD-2.3)

Employed by : Parse Command/Prepare Response (3.1.4.2.4.1)

Derived by : Display Image (3.1.4.2.2.4)

B.85 Incoming Mail

Incoming Mail represents all messages sent by users to the PDS Administer System (3.1.4.5) function. (Refer to Data Flow Diagrams: DFD-1.1, DFD-1.4, DFD-1)

Employed by :
Process Mail (3.1.4.1.4)
Process Mail Command (3.1.4.1.4.1)
Store Mail (3.1.4.1.4.3)

Derived by :
Support Communications (3.1.4.1.1)
Support Interactive Users (3.1.4.1.1.1)
Process Mail Command (3.1.4.1.4.1)

B.86 Inspect Data Commands

The Inspect Data Commands group shall contain commands to the Inspect Data (3.1.4.2) function supplied by interactive users. The syntactic correctness of these commands shall have been previously validated by the Interpret Command (3.1.4.1.2.4) function. These commands shall pertain to data retrieval, data manipulation, and data display. (Refer to Data Flow Diagrams: DFD-2.7, DFD-1, DFD-2, DFD-1.2, DFD-0)

Employed by :
Inspect Data (3.1.4.2)
Interpret Inspect Commands (3.1.4.2.4)
Parse Command/Prepare Response (3.1.4.2.4.1)

Derived by :
Access System (3.1.4.1)
High Level User Interface (3.1.4.1.2)
Communicate with Process (3.1.4.1.2.7)

B.87 Inspect Data Responses

The Inspect Data Responses group shall contain responses from the Inspect Data (3.1.4.2) function to interactive users. These responses shall do one of four things: inform a user that requested data is being brought on line, notify a user of the location of data at other sites (and provide available information regarding access methods), ask a user to verify or update the appropriate stored User Selection Parameters (B.192), or advise a user when problems exist with the user's Inspect Data (3.1.4.2). (Refer to Data Flow Diagrams: DFD-2.7, DFD-1, DFD-2, DFD-0, DFD-1.2)

Employed by :
Access System (3.1.4.1)
High Level User Interface (3.1.4.1.2)
Communicate with Process (3.1.4.1.2.7)

Derived by :
Inspect Data (3.1.4.2)
Interpret Inspect Commands (3.1.4.2.4)
Parse Command/Prepare Response (3.1.4.2.4.1)

B.88 Interpreted Command

An Interpreted Command is a command that has been fully validated and converted into a form interpretable by the executable processes. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Communicate with Process (3.1.4.1.2.7)

Derived by : Interpret Command (3.1.4.1.2.4)

B.89 MOU

The MOU group shall contain a Memorandum of Understanding documenting the agreement negotiated by the DA team with the producer (or supplier) of each data set. This agreement shall address the contents and format of a data set, as well as data integrity, security, privacy, and other considerations. (Refer to Data Flow Diagrams: DFD-6.4, DFD-6)

Employed by : PDS Data Suppliers (3.1.6.1.1)
Database Administration (3.1.4.5.4)

Derived by : Database Administration (3.1.4.5.4)
Acquire Data (3.1.4.5.4.6)
Acquire System Software (3.1.4.5.4.7)
PDS Data Suppliers (3.1.6.1.1)

B.90 Mail Commands

Mail Commands consists of all operator directives to the PDS mail function. These will include commands to display a directory of messages waiting, display the text of an individual message, permit the entry of a message for the PDS, and delete messages from the user's mail directory. (Refer to Data Flow Diagrams: DFD-1.1, DFD-1, DFD-1.4)

Employed by : Process Mail (3.1.4.1.4)
Process Mail Command (3.1.4.1.4.1)

Derived by : Support Communications (3.1.4.1.1)
Support Interactive Users (3.1.4.1.1.1)

B.91 Manipulation Command Error Message

The Manipulation Command Error Message group shall contain a message to a user indicating that the Manipulation Data Command (B.92) is incompatible with the data the user wants to manipulate, or that an error in manipulation processing has occurred. (Refer to Data Flow Diagrams: DFD-2.5, DFD-2.7)

Employed by : Parse Command/Prepare Response (3.1.4.2.4.1)
Route Parsed Commands (3.1.4.2.4.2)
Interpret Manipulate Command (3.1.4.2.3.1)

Derived by : Interpret Manipulate Command (3.1.4.2.3.1)
Statistical Functions (3.1.4.2.3.2)
Sample Data (3.1.4.2.3.3)
Convert Data (3.1.4.2.3.4)
Image Processing (3.1.4.2.3.5)

B.92 Manipulation Data Command

The Manipulation Data Command group shall contain a parsed, complete, and valid command for the manipulation of data retrieved from the working set to facilitate the user's assessing of the data. The commands shall pertain to four classes of processing: conversion, sampling and statistical operations, and image processing. It will not be possible to apply all types of manipulation processing to all types of data. (Refer to Data Flow Diagrams: DFD-2, DFD-2.7, DFD-2.5)

Employed by : Manipulate Inspect Data (3.1.4.2.3)

Derived by : Interpret Inspect Commands (3.1.4.2.4)

B.93 Menu Definition

The Menu Definition data store contains all information required to support a hierarchical menu system. This information includes a definition of the menu hierarchy, the format of each menu screen, a definition of allowable user choices for each screen, a definition of allowable user parameters for each screen, and any supporting executable instructions required to perform choices selected by the user. (Refer to Data Flow Diagrams: DFD-1.2)

Read by : Manage Menu (3.1.4.1.2.2)

B.94 Menu Information

The Menu Information data store contains additional information about choices and parameters available for user entry for each menu screen. This information shall be hierarchicaly arranged so that successively more detailed information on a particular subject can be retrieved. This Help information shall be retrievable by the user through the entry of a Help menu option whenever there is any doubt about the form or format of a menu choice or parameter. (Refer to Data Flow Diagrams: DFD-1.2)

Read by : Manage Menu (3.1.4.1.2.2)

B.95 Menu Input

Menu Input represents all imput entered by a user in response to a menu. These can consist of a choice selection or the entry of one or more parameters. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Manage Menu (3.1.4.1.2.2)

Derived by : Route Input (3.1.4.1.2.1)

B.96 Menu Response

Menu Response represents responses returned to the user as a result of Menu Input (B.95). These can consist of a new menu, displayed data, help information, or an error message. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Route Input (3.1.4.1.2.1)

Derived by : Manage Menu (3.1.4.1.2.2)

B.97 Menu Run Request

A Menu Run Request is a notification from the Manage Menu (3.1.4.1.2.2) process that the user wants to execute a process based on data selected or entered in the current (or prior) menus. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Interpret Menu Input (3.1.4.1.2.3)

Derived by : Manage Menu (3.1.4.1.2.2)

B.98 Non DBMS Controlled

The Non DBMS Controlled set consists of data in machine readable or non-machine readable format which is stored by PDS but is accessed and maintained using special application programs, operating system utilities or manual procedures, due to storage format, volume or special access constraints. Major categories of the Non DBMS Controlled set are on line Non-DBMS data such as data files stored on optical storage devices, and the operational local archive, which consists of offline storage (magnetic tapes, magnetic disks or optical discs), the distribution inventory and non-machine readable data. (Refer to Data Flow Diagrams: SSD-0)

Contains Data Stores:

2 On Line Non DBMS Data (B.105)
2 Operational Local Archive (B.106)
3 Offline Storage (B.103)
3 Distribution Inventory (B.67)
3 Non Machine Readable (B.100)

B.99 Non DBMS Working Data Set

A working data set which is not under the control of the data base management system (DBMS). (Refer to Data Flow Diagrams: SSD-0)

B.100 Non Machine Readable

The Non Machine Readable item consists of planetary science data sets which are not in standard machine readable formats. (Refer to Data Flow Diagrams: SSD-0)

B.101 Non Transcribed Data

This item consists of a data package component which is not in a machine-readable format which can be recognized or processed on the PDS computer (analog tape, hardcopy, plots, images). (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Convert Media (3.1.4.6.1.5)

Derived by : Evaluate Format (3.1.4.6.1.1)

B.102 Notice of Processed Order

The Notice of Processed Order is an internal system notice to Remove Pending Order (3.1.4.4.4) that an order has been fully processed. In the case of electronic distribution, the Notice of Processed Order indicated that the data has been successfully transmitted. In the case of manually filled orders, it is an indication that the data has been shipped. In either case, the Notice of Processed Order triggers the removal of the order from the (**). (Refer to Data Flow Diagrams: DFD-5)

Employed by : Remove Pending Order (3.1.4.4.4)

Derived by : Process Order Manually (3.1.4.4.2)
Distribute Data Online (3.1.4.4.5)
NSSDC (3.1.6.1.1.2.2)

B.103 Offline Storage

The Offline Storage consists of data sets which are stored on mountable media such as magnetic tape and magnetic or optical disk. (Refer to Data Flow Diagrams: SSD-0, DFD-6.4)

B.104 On Line Data Distribution Requests

(Refer to Data Flow Diagrams: DFD-0)

Employed by : Access System (3.1.4.1)
Transfer Data (3.1.4.1.3)

Derived by : Distribute Data (3.1.4.4)
Distribute Data Online (3.1.4.4.5)

B.105 On Line Non DBMS Data

The On Line Non DBMS Data set shall contain critical science data sets and ancillary data stored in VAX VMS files. (Refer to Data Flow Diagrams: SSD-0, DFD-7.5)

Read by : Service Data Storage Requests (3.1.4.6.5.7)

Written by : Retrieve Non DBMS Data (3.1.4.2.1.3)
Service Data Storage Requests

B.106 Operational Local Archive

The Operational Local Archive shall contain data in offline storage (on magnetic tapes, magnetic disks or optical disks) the inventory of data awaiting distribution, and data in non-machine readable form. (Refer to Data Flow Diagrams: DFD-7.5, SSD-0, DFD-2.1, DFD-5.4, DFD-6.4)

Contains Data Stores:

2 Offline Storage (B.103)
2 Distribution Inventory (B.67)
2 Non Machine Readable (B.100)

Read by : Retrieve Ordered Non DBMS Data (3.1.4.4.3.3)

Written by : Maintain Archive (3.1.4.5.4.2)

B.107 Operational Planetary Data

The Operational Planetary Data set shall contain all PDS supported data sets (i.e., planetary science data, sample/summary data and ancillary data), Planetary Data Archive (B.122), as well as system support data (see DBMS Controlled (B.24)) and catalog data (see Catalog (B.6)). It will also contain a duplicate copy of all data sets stored in the PDS archive except those of strictly archive significance.

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Contains Data Stores:

2 DBMS Controlled (B.24)
3 System Support Data (B.173)
3 DBMS Reference Data (B.26)
4 Catalog (B.6)
5 High Level Catalog (B.82)
5 Detail Level Catalog (B.62)
4 Permanent Science Data (B.121)
5 Summary Sample Data (B.162)
5 Science Data (B.145)
2 Non DBMS Controlled (B.98)
3 On Line Non DBMS Data (B.105)
3 Operational Local Archive (B.106)
4 Offline Storage (B.103)
4 Distribution Inventory (B.67)
4 Non Machine Readable (B.100)

2 Working Data Set (B.197)
3 DBMS Working Data Set (B.28)
3 Non DBMS Working Data Set (B.99)

Read by :
Administer System (3.1.4.5)
Distribute Data (3.1.4.4)
Inspect Data (3.1.4.2)
Maintain Data Integrity (3.1.4.5.4.4)
Maintain Storage Hierarchy (3.1.4.5.4.1)
Monitor Data Accounting (3.1.4.5.4.5)
Order Data (3.1.4.3)
Prepare Data (3.1.4.6)
Process Order Manually (3.1.4.4.2)
Retrieve Ordered Data (3.1.4.4.3)
Store Data (3.1.4.6.5)
Verify Data Definition Correct (3.1.4.3.8)

Written by :
Administer System (3.1.4.5)
Maintain Data Integrity
Maintain Online PSD
Maintain Storage Hierarchy
Prepare Data
Retrieve Ordered Data
Store Data

B.108 Order Confirmation to User

The Order Confirmation to User is a notice to the user who submitted a data order that the data order has been executed. This notice shall be distributed electronically via the Process Mail (3.1.4.1.4) process or manually by a letter of telephone contact. (Refer to Data Flow Diagrams: DFD-5)

Employed by : Send Order Confirmation Mail (3.1.4.4.1)

Derived by : Remove Pending Order (3.1.4.4.4)

B.109 Order Data Commands

Order Data Commands consists of user entered commands or menu selections that relate to the Order Data (3.1.4.3) function. These commands initiate the ordering process, enter user data information, enter data definition information, and verify that the order is satisfactory to the user. (Refer to Data Flow Diagrams: DFD-1, DFD-1.2, DFD-0, DFD-3)

Employed by :
Order Data (3.1.4.3)
Interpret Order Commands (3.1.4.3.6)

Derived by :
Access System (3.1.4.1)
High Level User Interface (3.1.4.1.2)

B.110 Order Data Responses

Order Data Responses consists of responses by the Order Data (3.1.4.3) function to Order-Data Commands. These responses are error indications when errors are found in user data information or data definition information. In addition, the system shall respond with a full description of the proposed order for the user to approve. (Refer to Data Flow Diagrams: DFD-1, DFD-3, DFD-1.2, DFD-0)

Employed by : Access System (3.1.4.1)
High Level User Interface (3.1.4.1.2)
Communicate with Process (3.1.4.1.2.7)

Derived by : Order Data (3.1.4.3)
Interpret Order Commands (3.1.4.3.6)

B.111 Order Verification/Correction

The Order Verification/Correction group shall contain a response from an interactive user who has ordered data. This response shall either verify the User Selection Parameters (B.192) stored for that user, or request changes to some or all parameters. (Refer to Data Flow Diagrams: DFD-3)

Employed by : Verify Data Definition Correct (3.1.4.3.8)

Derived by : Interpret Order Commands (3.1.4.3.6)

B.112 Order for Data Storage Change

The Order for Data Storage Change group shall contain a request from Maintain Storage Hierarchy (3.1.4.5.4.1) to relocate a formerly off line data set, supplied via a Data for Restore (B.54) message, to on line storage, or a request from Maintain Storage Hierarchy (3.1.4.5.4.1) to relocate on an on line data set to the Operational Local Archive (B.106) (off line). (Refer to Data Flow Diagrams: DFD-6.4)

Employed by : Maintain Online PSD (3.1.4.5.4.3)

Derived by : Maintain Storage Hierarchy (3.1.4.5.4.1)

B.113 Order for Restore

The Order for Restore group shall contain a request for a dataset currently stored off-line to be sent to the Maintain Online PSD (3.1.4.5.4.3) function and brought on-line.

The Order for Restore group shall contain a request for a data set currently stored off line to be sent to the Maintain Online PSD (3.1.4.5.4.3) function to be brought on line. (Refer to Data Flow Diagrams: DFD-6.4)

Employed by : Maintain Archive (3.1.4.5.4.2)

Derived by : Maintain Storage Hierarchy (3.1.4.5.4.1)

B.114 Ordered Data

The Ordered Data group shall contain data retrieved from the Working Data Set (B.197) for display to a user in textual, graphic, or image form. (Refer to Data Flow Diagrams: DFD-2.3)

Employed by : Display Text (3.1.4.2.2.2)
Display Graph (3.1.4.2.2.3)
Display Image (3.1.4.2.2.4)

Derived by : Interpret Display Command (3.1.4.2.2.1)

B.115 Orders for Deferred Distribution

(Refer to Data Flow Diagrams: DFD-3)

Employed by : Prepare Order Form (3.1.4.3.4)

Derived by : Select On Line Orders (3.1.4.3.3)

B.116 Orders for On Line Data Distribution

Orders for On Line Data Distribution is an Accepted Data Order (B.1) which requests electronic distribution of the data. (Refer to Data Flow Diagrams: DFD-5.4, DFD-5, DFD-3, DFD-2.7, DFD-2, DFD-2.1)

Employed by : Interpret Order Retrieve Command (3.1.4.4.3.2)
Retrieve Ordered Data (3.1.4.4.3)
Interpret Order Retrieve Command (3.1.4.4.3.2)

Derived by : Verify User Information Complete (3.1.4.3.1)
Select On Line Orders (3.1.4.3.3)

B.117 Outgoing Mail

Outgoing Mail shall consist of communications from the PDS computer to the user which are generated asynchronously, when the user is not necessarily connected to the PDS. These Outgoing Mail messages are retrieved at the convenience of the user during a time when he is logged in to the PDS. Outgoing Mail shall consist of Order Confirmation to User (B.108) in version 1 of PDS. (Refer to Data Flow Diagrams: DFD-1.1, DFD-1.4, DFD-1)

Employed by :
Support Communications (3.1.4.1.1)
Support Interactive Users (3.1.4.1.1.1)
Process Mail Command (3.1.4.1.4.1)

Derived by :
Process Mail (3.1.4.1.4)
Process Mail Command (3.1.4.1.4.1)
Retrieve Mail (3.1.4.1.4.2)

B.118 Parsed Commands

The Parsed Commands group shall contain parsed, complete, and valid commands with associated parameters, to be routed to the Inspect Data (3.1.4.2) sub-functions. These commands shall pertain to data retrieval, data manipulation, and data display. (Refer to Data Flow Diagrams: DFD-2.7)

Employed by :
Route Parsed Commands (3.1.4.2.4.2)

Derived by :
Parse Command/Prepare Response (3.1.4.2.4.1)

B.119 Pending Mail

The Pending Mail set shall contain user inquiry mail messages awaiting a response from the customer support sub-functions. It shall also include responses from the customer support to the user regarding a user inquiry. (Refer to Data Flow Diagrams: DFD-6.1, DFD-5, DFD-1.4)

Read by :
Access User Inquiry Mail (3.1.4.5.1.6)
Process Mail Command (3.1.4.1.4.1)
Retrieve Mail (3.1.4.1.4.2)

Written by :
Access User Inquiry Mail (3.1.4.5.1.6)
Process Mail Command
Send Order Confirmation Mail
Store Mail

B.120 Pending Orders

The Pending Orders set shall contain information concerning the current status of outstanding user orders for data and data processing. (Refer to Data Flow Diagrams: DFD-5, DFD-3, DFD-6.1)

Read by :	Consult on Data Usage (3.1.4.5.1.4)
Written by :	Accept Order (3.1.4.3.2) Remove Pending Order

B.121 Permanent Science Data

The Permanent Science Data set shall contain all science data, summary and sample data, and ancillary data which is stored on line under DBMS control for reference by PDS users. (Refer to Data Flow Diagrams: SSD-0)

Contains Data Stores:

2 Summary Sample Data (B.162)
2 Science Data (B.145)

B.122 Planetary Data Archive

The Planetary Data Archive set shall contain a master copy of all planetary science data sets, their documentation, and associated software. The Planetary-Data-Archive shall be a deep storage archive where data sets shall be added but not deleted. (Refer to Data Flow Diagrams: DFD-7, DFD-7.5, DFD-0, SSD-0, DFD-6.4)

Read by :	Administer System (3.1.4.5) Maintain Archive (3.1.4.5.4.2)
Written by :	Administer System (3.1.4.5) Maintain Archive Prepare Data Service Data Storage Requests Store Data

B.123 Planetary Science Data

The Planetary Science Data set shall contain all on line PDS operational planetary data, all PDS operational local archive data and all data in the Planetary Data Archive (deep storage). This shall include system support data, catalog data, sample/summary data, planetary science data, ancillary data, software and documentation. (Refer to Data Flow Diagrams: CSD-0, SSD-0, DFD-6)

Contains Data Stores:

2 Operational Planetary Data (B.107)
3 DBMS Controlled (B.24)
4 System Support Data (B.173)
4 DBMS Reference Data (B.26)
5 Catalog (B.6)
6 High Level Catalog (B.82)
6 Detail Level Catalog (B.62)
5 Permanent Science Data (B.121)
6 Summary Sample Data (B.162)
6 Science Data (B.145)
3 Non DBMS Controlled (B.98)
4 On Line Non DBMS Data (B.105)
4 Operational Local Archive (B.106)
5 Offline Storage (B.103)
5 Distribution Inventory (B.67)
5 Non Machine Readable (B.100)
3 Working Data Set (B.197)
4 DBMS Working Data Set (B.28)
4 Non DBMS Working Data Set (B.99)
2 Planetary Data Archive (B.122)

Read by : Database Administration (3.1.4.5.4)
Planetary Data System (2)

Written by : Database Administration (3.1.4.5.4)
Planetary Data System

B.124 Prepared Order

The Prepared Order is displayed at the users terminal for a final manual verification of the order. This display will contain additional information available from the Operational Planetary Data (B.107) (Refer to Data Flow Diagrams: DFD-3)

Employed by : Interpret Order Commands (3.1.4.3.6)

Derived by : Verify Data Definition Correct (3.1.4.3.8)

B.125 Procedures and Macros

The Procedures and Macros data store contains all predefined executable procedures which can be invoked by the user. These Procedures and Macros shall permit the invocation of complex multi-step operations with the entry of a single PDS command. (Refer to Data Flow Diagrams: DFD-1.2)

Read by : Interpret Command (3.1.4.1.2.4)

B.126 Recommendation for Resource Allocation

The Recommendation for Resource Allocation group shall contain information pertaining to resource allocation or reallocation prepared by Accounting (3.1.4.5.3). (Refer to Data Flow Diagrams: DFD-6)

Employed by : Planning and Scheduling (3.1.4.5.2)

Derived by : Accounting (3.1.4.5.3)

B.127 Rejected Data with Content Error

The Rejected Data with Content Error item consists of a portion of submitted data package which has bad content and will be returned to the submitter. (Refer to Data Flow Diagrams: DFD-7)

Contains Data Flows:

2 Data Set with Missing Data (B.44)
2 Data Content Rejected by Review (B.31)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Check/ Sample Data Content (3.1.4.6.2)

B.128 Rejected Data with Format Error

(Refer to Data Flow Diagrams: DFD-7)

Contains Data Flows:

2 Data Set with Physical Error (B.41)
2 Data with Undocumented Format (B.60)
2 Data with Incorrect Format (B.58)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Check Data Format (3.1.4.6.1)

B.129 Rejected Data Set with Explanation

This item consists of a data set which has passed all format, content, continuity and parameter checks but is rejected by the review process. (Refer to Data Flow Diagrams: DFD-7, DFD-7.4)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Review of Data by Peers (3.1.4.6.4)
Evaluate Review Results (3.1.4.6.4.4)

B.130 Rejected Data and Software

(Refer to Data Flow Diagrams: DFD-0, CSD-0)

Contains Data Flows:

2 Rejected Data with Format Error (B.128)
3 Data Set with Physical Error (B.41)
3 Data with Undocumented Format (B.60)
3 Data with Incorrect Format (B.58)
2 Rejected Data with Content Error (B.127)
3 Data Set with Missing Data (B.44)
3 Data Content Rejected by Review (B.31)
2 Rejected Software (B.131)
2 Rejected Data Set with Explanation (B.129)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Planetary Data System (2)
Prepare Data (3.1.4.6)

B.131 Rejected Software

This item consists of a software set which does not meet PDS documentation and quality standards. (Refer to Data Flow Diagrams: DFD-7, DFD-7.3)

Employed by : PDS Data Suppliers (3.1.6.1.1)

Derived by : Validate Software (3.1.4.6.3)
Evaluate Software Completeness (3.1.4.6.3.1)
Evaluate Software Quality (3.1.4.6.3.2)

B.132 Request for Non DBMS Data

The Request for Non DBMS Data group shall contain selection parameters for the retrieval of data which resides on line at the central node but which is not under DBMS control. (Refer to Data Flow Diagrams: DFD-5.4, DFD-2.1)

Employed by :
Retrieve Non DBMS Data (3.1.4.2.1.3)
Retrieve Ordered Non DBMS Data (3.1.4.4.3.3)

Derived by :
Interpret Retrieve Command (3.1.4.2.1.1)
Interpret Order Retrieve Command (3.1.4.4.3.2)

B.133 Request to Stage Data

The Request to Stage Data group shall contain selection parameters for the staging of data which resides off line but which is authorized to be brought on line under DBMS control or, in limited cases, online in VMS files not under DBMS control. The request shall include information from the
(**) that identifies exactly where the data is being stored off line (e.g., tape number, file number, or CDROM ID, etc.). The request may pertain to an entire data volume, a data package of related files, or selected individual data files. (Refer to Data Flow Diagrams: DFD-7.5, DFD-0, DFD-5.4, DFD-5, DFD-2.1, DFD-7, DFD-2)

Employed by :
Prepare Data (3.1.4.6)
Store Data (3.1.4.6.5)
Service Data Staging Requests (3.1.4.6.5.8)
Prepare Data (3.1.4.6)
Store Data (3.1.4.6.5)
Service Data Staging Requests (3.1.4.6.5.8)

Derived by :
Inspect Data (3.1.4.2)
Retrieve Inspect Data (3.1.4.2.1)
Interpret Retrieve Command (3.1.4.2.1.1)
Distribute Data (3.1.4.4)
Retrieve Ordered Data (3.1.4.4.3)
Interpret Order Retrieve Command (3.1.4.4.3.2)

B.134 Requests for more User Information

Requests for more User Information consists of Order Data Responses (B.110) which request more information about the user. This shall be required when the data in the User Profile (B.191) is not complete.

The Requests for more User Information group shall contain the message from the Extract Data Definition (3.1.4.3.7) function to an interactive user who has ordered data. This message shall ask the user to review the appropriate set of stored User Selection

Parameters (B.192) and either verify the parameters or change some or all parameters. (Refer to Data Flow Diagrams: DFD-3)

Employed by : Interpret Order Commands (3.1.4.3.6)

Derived by : Verify User Information Complete (3.1.4.3.1)

B.135 Restore Error Message

The Restore Error Message group shall contain a notification to Maintain Storage Hierarchy (3.1.4.5.4.1) that a (**) has been placed on hold while a schema is developed for the data set, or that the
(**) cannot be serviced because storage capacity is insufficient. (Refer to Data Flow Diagrams: DFD-6.4)

Employed by : Maintain Storage Hierarchy (3.1.4.5.4.1)

Derived by : Maintain Online PSD (3.1.4.5.4.3)

B.136 Retrieve Data Commands

The Retrieve Data Commands group shall contain a parsed, complete, and valid request for the retrieval of data which resides on line under DBMS control, or selected sets of on line non-DBMS data. For requested data which is found to reside off line, staging in batch mode shall be required before retrieval can be accomplished. (Refer to Data Flow Diagrams: DFD-2.1, DFD-2, DFD-2.7)

Employed by : Retrieve Inspect Data (3.1.4.2.1)
Interpret Retrieve Command (3.1.4.2.1.1)

Derived by : Interpret Inspect Commands (3.1.4.2.4)
Route Parsed Commands (3.1.4.2.4.2)

B.137 Retrieve Data Notification

Retrieve Data Notification is a notification to the Distribute Data Online (3.1.4.4.5) process that the requested data has been successfully retrieved and that the distribution should commence. (Refer to Data Flow Diagrams: DFD-5.4, DFD-5.9, DFD-5)

Employed by : Distribute Data Online (3.1.4.4.5)

Derived by : Retrieve Ordered Data (3.1.4.4.3)
Interpret Order Retrieve Command (3.1.4.4.3.2)

B.138 Review Materials

This item consists of data package documentation, PDS test results and sample data products which are used by the peer review board to determine whether components of a submitted data package should become part of the PDS data storage system. (Refer to Data Flow Diagrams: DFD-7.4)

Employed by : Conduct Review (3.1.4.6.4.3)

Derived by : Prepare and Distribute Review Materials (3.1.4.6.4.2)

B.139 Review Results

This item consists of the proceedings of the data review panel and their conclusions regarding the data set format, content, documentation, ancillary data and software. It also contains recommendations to the data administrator regarding the data quality and data level tags to be assigned to the data set, the position of the data set in the data heirarchy, the number of inventory copies required, the portions of the data package which must be submitted to the PDS archive and whether copies of the the data set shall be immediately distributed to any of the standing distribution lists. (Refer to Data Flow Diagrams: DFD-7.4)

Employed by : Evaluate Review Results (3.1.4.6.4.4)

Derived by : Conduct Review (3.1.4.6.4.3)

B.140 Review Schedule

This item consists of the schedule of activities to be carried out for the review of data by peers function. It includes the review date and agenda, and identifies key dates for review preparation activities (review notice to board members, review material delivery to board members, etc). (Refer to Data Flow Diagrams: DFD-7.4)

Employed by : Prepare and Distribute Review Materials (3.1.4.6.4.2)
Conduct Review (3.1.4.6.4.3)

Derived by : Schedule Review (3.1.4.6.4.1)

B.141 Software Data for Update

This item consists of one or more files containing source or executable routines or software libraries extracted from the components of a data package which will be used to update the PDS data storage heirarchy. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Service Data Storage Requests (3.1.4.6.5.7)

Derived by : Prepare Software Library (3.1.4.6.5.5)

B.142 Software Standards for Submission

The Software Standards for Submission group shall include PDS software standards information contained in the Software Standards (B.151) set, and it shall be sent to the responsible data suppliers and designers for their use in preparing software to be submitted to the PDS. (Refer to Data Flow Diagrams: DFD-6.4, DFD-6)

Employed by : PDS Data Suppliers (3.1.6.1.1)
Database Administration (3.1.4.5.4)

Derived by : Database Administration (3.1.4.5.4)
Acquire System Software (3.1.4.5.4.7)
PDS Data Suppliers (3.1.6.1.1)

B.143 Sample Command

The Sample Command group shall contain an executable sequence of commands for performing basic data sampling operations on retrieved data. (Refer to Data Flow Diagrams: DFD-2.5)

Employed by : Sample Data (3.1.4.2.3.3)

Derived by : Interpret Manipulate Command (3.1.4.2.3.1)

B.144 Sample/Summary Data for Update

This item consists of one or more files containing sample/summary data extracted from the components of a data package which will be used to update the PDS data storage heirarchy. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Service Data Storage Requests (3.1.4.6.5.7)

Derived by : Prepare Sample/ Summary Data (3.1.4.6.5.3)

B.145 Science Data

Science Data shall contain science data sets and ancillary data which are to be stored on line under DBMS control for access by PDS users. (Refer to Data Flow Diagrams: SSD-0)

B.146 Science Data Inquiries

The Science Data Inquiries group shall contain a user inquiry regarding PDS science data sets, the status of data orders, or the status of data preparation requests. (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Consult on Data Usage (3.1.4.5.1.4)

Derived by : Route User Request (3.1.4.5.1.1)

B.147 Science Data Inquiry Response

The Science Data Inquiry Response group shall contain a message from the Consult on Data Usage (3.1.4.5.1.4) function to a user in response to Science Data (B.145). This response shall advise the user regarding the availability and location of PDS science data sets, refer the user to a consultant at a particular discipline node, instruct the user in the use of the Inspect Data (3.1.4.2) function, or answer inquiries regarding data order or data preparation status. (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Route User Request (3.1.4.5.1.1)

Derived by : Consult on Data Usage (3.1.4.5.1.4)

B.148 Science Data for Update

This item consists of one or more files containing science data extracted from the components of a data package which will be used to update the PDS data storage heirarchy. (Refer to Data Flow Diagrams: DFD-7.5)

Employed by : Service Data Storage Requests (3.1.4.6.5.7)

Derived by : Prepare Science Data (3.1.4.6.5.4)

B.149 Session Log

The Session Log shall record all input by the user during his PDS session. Only PDS commands shall be recorded. Menu choices and parameters shall always be converted to the corresponding PDS command language prior to storage in the Session Log. (Refer to Data Flow Diagrams: DFD-1.2)

Read by : Interpret Command (3.1.4.1.2.4)

Written by : Interpret Command (3.1.4.1.2.4)

B.150 Software Library

The Software Library data store will contain source code, executables, and callable libraries of utility functions to support analysis and display of planetary science data sets. (Refer to Data Flow Diagrams: DFD-6.4)

B.151 Software Standards

The Software Standards set shall contain guidelines and standards specifications which shall be used in the development or conversion of all operational or science analysis software. These standards apply to system software developed internally by PDS and applications software developed and submitted by data suppliers. They shall address languages, documentation standards, transportability standards and coding conventions (Refer to Data Flow Diagrams: DFD-7.3)

Read by : Acquire System Software (3.1.4.5.4.7)
Convert Science Data Software (3.1.4.6.3.5)
Evaluate Software Quality (3.1.4.6.3.2)

Written by : Acquire System Software (3.1.4.5.4.7)

B.152 Solicitation for Data to Include

The Solicitation for Data to Include group shall contain a request for a PDS responsible data supplier to provide a data set to be included in the PDS, and information concerning the data set. The Solicitation for Data to Include shall be a response to a validated Solicitation to Include Data (B.154). (Refer to Data Flow Diagrams: DFD-6.4, DFD-6)

Contains Data Flows:

2 Solicitation to Include Data (B.154)

Employed by : PDS Data Suppliers (3.1.6.1.1)
Database Administration (3.1.4.5.4)

Derived by : Database Administration (3.1.4.5.4)
Acquire Data (3.1.4.5.4.6)
PDS Data Suppliers (3.1.6.1.1)

B.153 Solicitation for Software to Include

The Solicitation for Software to Include group shall contain a request for a responsible data supplier to provide particular software for inclusion in the PDS and information concerning the software. This shall pertain to software for product development (to be integrated into the PDS), or to self-contained science analysis programs for particular data sets (to be stored by PDS and made available upon user request). (Refer to Data Flow Diagrams: DFD-6.4, DFD-6)

Contains Data Flows:

2 Solicitation to Include Software (B.155)

Employed by : PDS Data Suppliers (3.1.6.1.1)
Database Administration (3.1.4.5.4)

Derived by : Database Administration (3.1.4.5.4)
Acquire System Software (3.1.4.5.4.7)
PDS Data Suppliers (3.1.6.1.1)

B.154 Solicitation to Include Data

The Solicitation to Include Data group shall contain a request for a particular data set to be included in the PDS. The Solicitation to Include Data shall be accepted from PDS users, NASA Headquarters, the PSDSG, and PDS management. (Refer to Data Flow Diagrams: DFD-6.4)

Employed by : Acquire Data (3.1.4.5.4.6)

Derived by : PDS Data Suppliers (3.1.6.1.1)

B.155 Solicitation to Include Software

The Solicitation to Include Software group shall contain a request for particular software to be included in PDS. This shall pertain to software for product development integrated into the PDS or to self-contained science analysis programs to be provided with particular data sets supplied by the discipline nodes. The Solicitation to Include Software shall be accepted from PDS users, NASA Headquarters, the PSDSG, and PDS management. (Refer to Data Flow Diagrams: DFD-6, DFD-6.4)

Employed by : Database Administration (3.1.4.5.4)
Acquire System Software (3.1.4.5.4.7)

Derived by : PDS Data Suppliers (3.1.6.1.1)

B.156 Start Notification

The Start Notification is the confirmation to the user that the requested process has actually been started. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Interpret Command (3.1.4.1.2.4)

Derived by : Start Process (3.1.4.1.2.5)

B.157 Start Process Request

A Start Process Request shall indicate to the Start Process (3.1.4.1.2.5) function that the user has requested that a computer process be started. The Start Process Request can request the start of an asynchronous process (one that runs independently of the user at the terminal) or a synchronous process (one that communicated with the user at the terminal). (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Start Process (3.1.4.1.2.5)

Derived by : Interpret Command (3.1.4.1.2.4)

B.158 Statistics Command

The Statistics Command group shall contain an executable sequence of commands for performing basic statistical operations on retrieved manipulatable data. (Refer to Data Flow Diagrams: DFD-2.5)

Employed by : Statistical Functions (3.1.4.2.3.2)

Derived by : Interpret Manipulate Command (3.1.4.2.3.1)

B.159 Submitted Science Data

The Submitted Science Data consists of the science data portion of a data package submitted to the Prepare Data (3.1.4.6). (Refer to Data Flow Diagrams: DFD-7)

Employed by : Check Data Format (3.1.4.6.1)
Evaluate Format (3.1.4.6.1.1)

Derived by : PDS Data Suppliers (3.1.6.1.1)

B.160 Submitted Science Data and Software

The Submitted Science Data and Software item consists of the science and software components of a data package submitted to the Prepare Data (3.1.4.6) function. (Refer to Data Flow Diagrams: CSD-0, DFD-7.1, DFD-7, DFD-0)

Contains Data Flows:

2 Submitted Science Software (B.161)

Employed by : Planetary Data System (2)
Prepare Data (3.1.4.6)

Derived by : PDS Data Suppliers (3.1.6.1.1)

B.161 Submitted Science Software

The Submitted Science Software consists of the software component of a data package submitted to the Prepare Data (3.1.4.6) function.

(Refer to Data Flow Diagrams: DFD-7, DFD-7.3)

Employed by : Validate Software (3.1.4.6.3)
Evaluate Software Completeness (3.1.4.6.3.1)
Reformat to Standard (3.1.4.6.1.6)

Derived by : PDS Data Suppliers (3.1.6.1.1)

B.162 Summary Sample Data

Summary Sample Data shall contain summaries of particular science data sets and data samples extracted from science data sets, for reference by PDS users. (Refer to Data Flow Diagrams: SSD-0)

B.163 System Performance Measures

The System Performance Measures are performance parameters captured while monitoring the operating system. The System Performance Measures shall include but are not limited to:

Time to fill a data order
Time to complete data set preparation
Time to fill a documentation request
Start time, stop time, and description of hardware failures
Start time, stop time, and description of sofware failures
Increases or decreases in operational data at the nodes
Increases or decreases in archive data at the nodes
Increases or decreases in inventory at the nodes
Inspect or order requests per data set
Description of customer service transaction
Central node computer utilization
Distributed node computer utilization
DBMS machine utilization at central node
DBMS machine utilization at distributed node
Central node communication hardware utilization
Distributed node communication hardware utilization
Central Node peripheral utilization (tape, disk, printer, cd-rom)
Distributed Node peripheral utilization. (Refer to Data Flow Diagrams: DFD-6)

Read by : Accounting (3.1.4.5.3)

Written by : Accounting (3.1.4.5.3)

B.164 System Performance Reports

The System Performance Reports summarize the analysis of the performance parameters captured during the last period. The report shall include the following information:

Number of data order transactions
Number of data inspect transactions
Number of customer service transactions
Minimum, Average, Maximum time to fill a data order
Minimum, Average, Maximum time to complete data set preparation
Minimum, Average, Maximum time to fill a documentation request
Number and severity of hardware failures
Number and severity of sofware failures
Percentage of system down time
Amount of operational data on each media at the central node
Amount of archive data on each media at the central node
Amount of operational data on each media at the other nodes
Amount of archive data on each media at the other nodes
Inventory activity at the central node
Inventory activity at the other nodes
Amount of data inspected
Amount of data ordered
Central node computer utilization
Distributed node computer utilization
DBMS machine utilization at central node
DBMS machine utilization at distributed node
Central node communication hardware utilization
Distributed node communication hardware utilization
Central Node peripheral utilization (tape, disk, printer, cd-rom)
Distributed Node peripheral utilization. (Refer to Data Flow Diagrams: DFD-6)

Employed by : Planning and Scheduling (3.1.4.5.2)

Derived by : Accounting (3.1.4.5.3)

B.165 System Request Command

A System Request Command is a command asking for some service from the PDS operating system software. Typical requests shall include: lists of the user's directory, time of day display, operating system utility requests, and file manipulation requests. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Execute System Request (3.1.4.1.2.6)

Derived by : Interpret Command (3.1.4.1.2.4)

B.166 System Request Response

System Request Response is the generic name from any response from the operating system after executing a requested system function request. (Refer to Data Flow Diagrams: DFD-1.2)

Employed by : Interpret Command (3.1.4.1.2.4)

Derived by : Execute System Request (3.1.4.1.2.6)

B.167 System Resources Query

The System Resources Query group shall contain a query from Planning and Scheduling (3.1.4.5.2) regarding system capacities. (Refer to Data Flow Diagrams: DFD-6)

Employed by : Facilities (3.1.4.5.5)

Derived by : Planning and Scheduling (3.1.4.5.2)

B.168 System Resources Response

the System Resources Response group shall contain system capacity information in response to a System Resources Query (B.167). (Refer to Data Flow Diagrams: DFD-6)

Employed by : Planning and Scheduling (3.1.4.5.2)

Derived by : Facilities (3.1.4.5.5)

B.169 System Responses

System Responses shall be returned by the PDS operating system for every (**) entered by the user. (Refer to Data Flow Diagrams: DFD-1.1, CSD-0, DFD-1, DFD-0, DFD-1.2)

Contains Data Flows:

2 User Inquiry Response (B.189)

Employed by : PDS Users (3.1.6.1.2)
Support Local Users (3.1.4.1.1.4)
Support SPAN Network (3.1.4.1.1.5)
Support Dial In Users (3.1.4.1.1.6)
Local Users ()
SPAN Users ()

Dial In Users ()
Support Communications (3.1.4.1.1)
Support Interactive Users (3.1.4.1.1.1)

Derived by :

Planetary Data System (2)
Access System (3.1.4.1)
Support Communications (3.1.4.1.1)
Support Interactive Users (3.1.4.1.1.1)
Support Local Users (3.1.4.1.1.4)
Support SPAN Network (3.1.4.1.1.5)
Support Dial In Users (3.1.4.1.1.6)
High Level User Interface (3.1.4.1.2)
Route Input (3.1.4.1.2.1)

B.170 System Schedule

The System Schedule datastore contains dates, titles, and associated descriptions for scheduled events which will either affect the system operations or are of interest to the user community. (Refer to Data Flow Diagrams: DFD-6.1, DFD-6)

Read by :

Consult on System Usage (3.1.4.5.1.3)
Customer Support (3.1.4.5.1)
Planning and Scheduling (3.1.4.5.2)

Written by :

Consult on System Usage (3.1.4.5.1.3)
Customer Support
Planning and Scheduling

B.171 System Status Checks

The System Status Checks group shall contain information on the system status of all parts of the PDS. (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Consult on System Usage (3.1.4.5.1.3)

Derived by : Route User Request (3.1.4.5.1.1)

B.172 System Status Response

The System Status Response group shall contain information regarding the status of the operational PDS and on the near term operations schedule, in response to a user request. (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Route User Request (3.1.4.5.1.1)

Derived by : Consult on System Usage (3.1.4.5.1.3)

B.173 System Support Data

The System Support Data set shall contain information required to operate the PDS. This set shall include all PDS software and all documentation. (Refer to Data Flow Diagrams: SSD-0)

B.174 System Upgrade Plans

The System Upgrade Plans group shall contain information concerning planned upgrades to hardware, software, and other system resources. (Refer to Data Flow Diagrams: DFD-6)

Employed by : Facilities (3.1.4.5.5)

Derived by : Planning and Scheduling (3.1.4.5.2)

B.175 Test Results and Data Set Software

This item consists of a summary of the results of testing of science software submitted to PDS. The test results should indicate any errors which occurred during the test procedure or any other potential problems or leins encountered during testing. Samples of operations which deviated from anticipated performance shall be provided with the results. (Refer to Data Flow Diagrams: DFD-7.3)

Employed by : Administer Software Evaluation (3.1.4.6.3.3)

Derived by : Test Science Data Software (3.1.4.6.3.4)

B.176 Text for Display

The Text for Display group shall contain retrieved data in ASCII text form to be displayed to an interactive user. The text shall consist of reports specifying values for a set of parameters, or column listings in which each row consists of values of parameters identified at the head of each column. (Refer to Data Flow Diagrams: DFD-2.3, DFD-2.7)

Employed by : Parse Command/Prepare Response (3.1.4.2.4.1)

Derived by : Display Text (3.1.4.2.2.2)

B.177 Transcribed Data

This item consists of data package components which were in non-machine readable format and have been converted to digital representation. (Refer to Data Flow Diagrams: DFD-7.1)

Employed by : Evaluate Format (3.1.4.6.1.1)

Derived by : Convert Media (3.1.4.6.1.5)

B.178 Transfer Data Blocks

Transfer Data Blocks are the communication units of data that is electronically distributed. (Refer to Data Flow Diagrams: DFD-1.1, DFD-1, DFD-1.3)

Employed by :
Support Local Users (3.1.4.1.1.4)
Support SPAN Network (3.1.4.1.1.5)
Support Dial In Users (3.1.4.1.1.6)
Support Communications (3.1.4.1.1)
Support Data Transfer Protocol (3.1.4.1.1.2)

Derived by :
Support Data Transfer Protocol (3.1.4.1.1.2)
Transfer Data (3.1.4.1.3)
Control On Line Data Transfers (3.1.4.1.3.1)

B.179 Unreviewed Data Set

(Refer to Data Flow Diagrams: DFD-7.4)

B.180 User Accounts

The User Accounts datastore contains the user accounting information. This information is to include:

- User ID, passwords, privileges
- User name, institution, address, and phone
- User account number, balance
- User credit history
- User order history
- User service history.

(Refer to Data Flow Diagrams: DFD-6.1, DFD-6, DFD-6.4)

Read by :
Accounting (3.1.4.5.3)
Customer Support (3.1.4.5.1)

Database Administration (3.1.4.5.4)
Monitor Data Accounting (3.1.4.5.4.5)
Register Users (3.1.4.5.1.2)

Written by : Accounting (3.1.4.5.3)
Customer Support
Database Administration
Register Users

B.181 User Education Materials

The User Education Materials group shall include system documentation, maintenance and operation manuals, User's Manuals, and other user educational material (e.g., demos, quick reference guides) contained in the Documentation Library (B.68) and shall be made available in response to user requests. (Refer to Data Flow Diagrams: CSD-0, DFD-6.1, DFD-6, DFD-0)

Employed by : PDS Users (3.1.6.1.2)

Derived by : Planetary Data System (2)
Administer System (3.1.4.5)
Customer Support (3.1.4.5.1)
Prepare User Education Manual (3.1.4.5.1.5)

B.182 User ID Questions

The User ID Questions group shall contain questions regarding a User ID Request (B.183) to gather information needed for the User Profile (B.191) store, or needed in conjunction with an account request from a potential user not previously authorized to gain access to PDS. (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Route User Request (3.1.4.5.1.1)

Derived by : Register Users (3.1.4.5.1.2)

B.183 User ID Request

The User ID Request group shall contain a request to open an account for a potential new user. (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Register Users (3.1.4.5.1.2)

Derived by : Route User Request (3.1.4.5.1.1)

B.184 User ID Response

The User ID Response group shall contain information concerning a potential new user in response to User ID Questions (B.182). (Refer to Data Flow Diagrams: DFD-6.1)

Employed by : Register Users (3.1.4.5.1.2)

Derived by : Route User Request (3.1.4.5.1.1)

B.185 User Information and Data Definition

User Information and Data Definition is the set of information consisting of verified user information and unverified data definition information. This data is sent to the Verify Data Definition Correct (3.1.4.3.8) process for full verification. (Refer to Data Flow Diagrams: DFD-3)

Employed by : Verify Data Definition Correct (3.1.4.3.8)

Derived by : Extract Data Definition (3.1.4.3.7)

B.186 User Information

User Information shall fully describe all information about the user which is required to fill the order. This information include name, address, phone number, institution, media options, and accounting information. (Refer to Data Flow Diagrams: DFD-3)

Employed by : Verify User Information Complete (3.1.4.3.1)

Derived by : Extract User Information (3.1.4.3.5)

B.187 User Input

User Input represents all the user entered menu responses and commands. User Input consists of all user inputs for all PDS functions: Inspect Data (3.1.4.2), Order Data (3.1.4.3), and other future PDS functions. (Refer to Data Flow Diagrams: DFD-1.1, CSD-0, DFD-1, DFD-0, DFD-1.2)

Contains Data Flows:

2 User Inquiry (B.188)

Employed by : High Level User Interface (3.1.4.1.2)
Route Input (3.1.4.1.2.1)
Support Interactive Users (3.1.4.1.1.1)

Planetary Data System (2)
Access System (3.1.4.1)
Support Communications (3.1.4.1.1)
Support Local Users (3.1.4.1.1.4)
Support SPAN Network (3.1.4.1.1.5)
Support Dial In Users (3.1.4.1.1.6)

Derived by :

Support Communications (3.1.4.1.1)
Support Interactive Users (3.1.4.1.1.1)
Support Local Users (3.1.4.1.1.4)
Support SPAN Network (3.1.4.1.1.5)
Support Dial In Users (3.1.4.1.1.6)
PDS Users (3.1.6.1.2)
Local Users ()
SPAN Users ()
Dial In Users ()

B.188 User Inquiry

The User Inquiry group shall contain a request for a particular data set to be included in the PDS. The User Inquiry shall be accepted from PDS users, NASA Headquarters, the PSDSG, and PDS Management. (Refer to Data Flow Diagrams: DFD-6.1, DFD-6)

Employed by :

Customer Support (3.1.4.5.1)
Database Administration (3.1.4.5.4)
Route User Request (3.1.4.5.1.1)

Derived by :

PDS Users (3.1.6.1.2)

B.189 User Inquiry Response

The User Inquiry Response group shall contain user requests for information concerning user registration, system usage, data usage and ordering, documentation and other educational material. (Refer to Data Flow Diagrams: DFD-6.1, DFD-6)

Employed by :

PDS Users (3.1.6.1.2)

Derived by :

Customer Support (3.1.4.5.1)
Route User Request (3.1.4.5.1.1)

B.190 User Notification

The User Notification group shall contain messages from the Interpret Retrieve Command (3.1.4.2.1.1) function to an interactive user, in response to retrieve requests. There shall be three categories of response message. When user-requested data resides off line but may be brought on line under DBMS control via a staging request, the response message shall inform the user that the data is being brought on line. When user-requested data resides at one of the discipline nodes, the response message, based on the catalog and stock record inventory, shall notify the user of the location of the data and (where available) provide information regarding node access software. When data cannot be found to satisfy a retrieval request, the response message shall advise the user of the problem. (Refer to Data Flow Diagrams: DFD-2.1, DFD-2.7, DFD-3, DFD-2)

Employed by : Interpret Inspect Commands (3.1.4.2.4)
Parse Command/Prepare Response (3.1.4.2.4.1)

Derived by : Retrieve Inspect Data (3.1.4.2.1)
Interpret Retrieve Command (3.1.4.2.1.1)

B.191 User Profile

The User Profile data store contains information about each authorized PDS user. It contains information used to allow restricted access (password) to the PDS. It also contains information required for the data ordering process such as user name and address, institution, compatible data media, and accounting information. (Refer to Data Flow Diagrams: DFD-1.1, DFD-3, DFD-6.1, DFD-2.6)

Read by : Extract User Information (3.1.4.3.5)
Interpret Display Command (3.1.4.2.2.1)
Register Users (3.1.4.5.1.2)
Support System Security (3.1.4.1.1.3)

Written by : Register Users (3.1.4.5.1.2)

B.192 User Selection Parameters

The User Selection Parameters group shall contain parameter values for key data fields within the planetary science database. This group shall be used in ordering data or in making data retrieval request. There shall be an independent User Selection Parameters for each user. (Refer to Data Flow Diagrams: DFD-2.1, DFD-2.6, DFD-2.5, DFD-3)

Read by : Extract Data Definition (3.1.4.3.7)
Interpret Manipulate Command (3.1.4.2.3.1)

Written by : Retrieve DBMS Data (3.1.4.2.1.2)

B.193 Validated Data Set

This item consists of a data set which has passed all format, content, continuity and parameter checks as well as the peer review process and is ready to be added to the PDS data storage system. (Refer to Data Flow Diagrams: DFD-7.3, DFD-7.4, DFD-7, DFD-7.5)

Employed by : Store Data (3.1.4.6.5)
Extract Data (3.1.4.6.5.1)

Derived by : Review of Data by Peers (3.1.4.6.4)
Evaluate Review Results (3.1.4.6.4.4)

B.194 Validated Unreviewed Data Set

This item consists of a package of data which has completed all PDS quality checks and is ready for the peer review process. (Refer to Data Flow Diagrams: DFD-7)

Employed by : Review of Data by Peers (3.1.4.6.4)
Schedule Review (3.1.4.6.4.1)

Derived by : Validate Software (3.1.4.6.3)
Administer Software Evaluation (3.1.4.6.3.3)

B.195 Verified Data Order

A Verified Data Order is an order after both the User Information (B.186) and the User Selection Parameters (B.192) have been verified by the PDS to be valid. (Refer to Data Flow Diagrams: DFD-3)

Employed by : Accept Order (3.1.4.3.2)

Derived by : Verify Data Definition Correct (3.1.4.3.8)

B.196 Verified User Information

Verified User Information consists of user information that is correct and complete enough to fill the order. (Refer to Data Flow Diagrams: DFD-3)

Employed by : Extract Data Definition (3.1.4.3.7)

Derived by : Verify User Information Complete (3.1.4.3.1)

B.197 Working Data Set

The Working Data Set shall contain data retrieved from the operational database (on line or off line) in response to user requests. Data in the Working Data Set shall be available for further manipulation and processing. Whether the data resides physically or logically in the Working Data Set shall be determined during the PDS implementation phase. (Refer to Data Flow Diagrams: DFD-2, DFD-2.5, DFD-2.3, DFD-5.4, SSD-0, DFD-2.1, DFD-5, DFD-1.4)

Contains Data Stores:

2 DBMS Working Data Set (B.28)
2 Non DBMS Working Data Set (B.99)

Read by :
Control On Line Data Transfers (3.1.4.1.3.1)
Convert Data (3.1.4.2.3.4)
Display Data (3.1.4.2.2)
Distribute Data Online (3.1.4.4.5)
Image Processing (3.1.4.2.3.5)
Interpret Display Command (3.1.4.2.2.1)
Manipulate Inspect Data (3.1.4.2.3)
Sample Data (3.1.4.2.3.3)
Statistical Functions (3.1.4.2.3.2)

Written by :
Convert Data (3.1.4.2.3.4)
Image Processing
Manipulate Inspect Data
Retrieve DBMS Data
Retrieve Inspect Data
Retrieve Non DBMS Data
Retrieve Ordered DBMS Data
Retrieve Ordered Data
Retrieve Ordered Non DBMS Data
Sample Data
Statistical Functions

C Version 1.0 Data Sets

The following are the groups of observations being considered for inclusion in Version 1.0. Each group has been given four priorities which indicate the importance of including it in each of the following: the operational high-level catalog, the low-level catalog, browse data, and science data. For Version 1.0, it is the central node's responsibility to include data in the high and low level catalogs. It is the discipline node's responsibility to include browse and science data.

A table of the these data sets and their corresponding priorities is provided below. Descriptions of each the data set is also provided in this appendix.

	Node	High Lev Cat	Low Lev Cat	Browse Data	Browse Effort	Science Data	Science Effort
MAR9-IRR-Data	ATMOS	I	N	N	0	N	0
MAR9-UVS-Data	ATMOS	I	I	N	0	N	0
Mars-Cloud-Database	ATMOS	N	N	N	0	N	0
V-MAWD	ATMOS	I	N	N	0	I	1
V-MAWD-Help-Files	ATMOS	I					
VL-Meteorology-Data	ATMOS/VL	N	N	N	0	N	0
Pioneer-10/11-Datasets	FP	C	C	C	1	N	0
VGR-Additional-Jup/Sat-Data	FP	I	I	I	0	N	0
VGR1-Fluxgate-Magnetometer	FP	C	C	C	2	I	1
VGR1-Plasma-Data	FP	C	C	N	2	I	1
VGR1-Plasma-Wave-Data	FP	C	C	C	2	I	1
VGR2-Low-Energy-Chgd-Particles	FP	C	C	C	2	I	1
Jupiter-Satellite-Ephemeris	NAV	N	N	N	0	N	0
NAV-Software	NAV	N	N				
Planet-Ephemeris	NAV	N	N	N	0	N	0
Saturn-Satellite-Ephemeris	NAV	N	N	N	0	N	0
Seld-Planetary-Physical-Cnsts	NAV	I					
VGR1-Trajectory-{Launch-Sat}	NAV	N	N	N	0	N	0
VGR2-Trajectory-{Launch-Nep}	NAV	N	N	N	0	N	0
MAR6/7-IRR-Data	RAD	I	N	N	0	N	0
MAR6/7-IRS-Data	RAD	I	N	N	0	N	0
MAR9-IRIS-Data	RAD	N	N	N	0	N	0
V-IRTM-Data	RAD	I	I	N	0	I	1
V-IRTM-Help-Files	RAD	I					
Pioneer-11-Sat-IPP-RING	RING	I	I	N	0	N	0
Saturn-Ring-Atlas	RING	I	I	N	0	N	0
VGR-ISS-Ring-Jup	RING	I	I	N	0	I	1
VGR-ISS-Ring-Sat	RING	C	I	N	0	C	1
VGR1-RSS-Occn-Sat-Rings	RING	C	I	N	0	C	1
VGR2-PPS-Ring-Occn-Sat	RING	C	I	N	0	C	1
VGR2-UVS-Ring-Occn-Sat	RING	C	I	N	0	C	1
Earth-Based-Radar-Data	RPIF-J	I	N	N	0	N	0
Earth-Based-Scat-Data	RPIF-J	I	N	N	0	N	0
Images-General-EDR	RPIF-J			N	0	N	0
Imaging-General-Catalog	RPIF-J	C	C				
MAR9-Picture-Catalog	RPIF-J	C	C				
V-SEDR	RPIF-J	C	I				
V-Picture-Catalog	RPIF-W	C	C				
VSM-Images	RPIF-W			N	0	C	1
VL-General-Data	VL	N	N	N	0	N	0

1. Earth Based Radar Data

The Earth Based Radar Data data set consists of radar observations of Martian equatorial regions obtained by earth-based antennas (Goldstone, etc.). This data set provides surface altitude measurements along latitude swaths of the planet's surface. XIDL software routines are available on the PDS VAX to provide plots of data availability in lat/lon areas. Software is also available to overlay altitude values on images of the surface. Only a small portion of the available data has been reduced. RPIF J is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

2. Earth Based Scattering Data

The Earth Based Scattering Data data set contains radar scattering parameters for Mars. RPIF J is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

3. Images General EDR

Digital imaging data from Mariner, Viking and Voyager missions. The digital data is represented by the Planetary Image Archive tape set, consisting of 1200 6250-bpi tapes containing 140,000 images stored in VICAR format. Copies of image files will be available by request to the Multi-mission Image Processing Laboratory (MIPL). RPIF J is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	N/A
Central Node Priority	Low-Level Catalog:	N/A
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

4. Imaging General Catalog

Catalog information for the digital imaging data from Mariner, Viking and Voyager missions. The high level and low level catalog information will be extracted the planetary image data base (representing a subset of catalog parameters for all planetary missions), and from detailed planetary image catalogs maintained by the multi-mission image processing laboratory (MIPL). RPIF J is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Critical
Discipline Node Priority	Browse:	N/A
Discipline Node Priority	Science:	N/A

5. Jupiter Satellite Ephemeris

The Jupiter Satellite Ephemeris data set consists of polynomial coefficients which are used to compute the location of a satellite at a particular time. Navigation is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

6. Mariner 6/7 IRR Data

The Mariner-6/7 IRR Data data set consists of Infrared Radiometer Mars data from Mariner 6 & 7. It is a small dataset consisting of several kilobytes of ASCII data. The PDS High level catalog will contain information about this dataset. No Low Level Catalog data is planned. The size of this dataset makes it a good candidate for electronic distribution from the central site. Radiometry is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

7. Mariner 6/7 IRS Data

The Mariner-6/7 IRS Data data set contains Infrared Spectrometer Mars data from Mariner 6 & 7. The data set is approximately 2 megabytes in size. High Level Catalog information will be supplied. This data set should be centrally distributed.

Central Node Priority	High-Level Catalog:
Central Node Priority	Low-Level Catalog:
Discipline Node Priority	Browse:
Discipline Node Priority	Science:

8. Mariner 9 IRIS Data

The Mariner-9 IRIS Data data set contains Mariner 9 Infrared Interferometer Spectrometer data. This is a large dataset that will be available for browsing through the Flagstaff node using the Radiometry node SPECIO system. This dataset can be ordered from Flagstaff on tapes. Radiometry is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

9. Mariner 9 IRR Data

The Mariner-9 IRR Data data set contains Mariner 9 Infared Radiometer data. This data set is several megabytes in size. High Level Catalog info shall be provided with the data set. No Low Level Catalog data will be provided. The dataset is accessible via the Flagstaff XG system and can be ordered from them also. Atmospheres is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

10. Mariner 9 Picture Catalog

This data set consists of one tape containing parameters which will be used to populate the high and low level catalog for imaging. RPIF J is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Critical
Discipline Node Priority	Browse:	N/A
Discipline Node Priority	Science:	N/A

11. Mariner 9 UVS Data

The Mariner-9 UVS Data data set contains Mariner 9 Ultraviolet Spectrometer data. It is a very large dataset. High Level Catalog info shall be available for version 1.0. No Low Level Catalog data shall be available at the central node. Low Level Catalog information on the BrittonLee at LASP pointing to spectra shall be available. The spectra themselves will not be on the LASP Britton Lee. Atmospheres is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

12. Mars Cloud Database

This data set consists of characterizations of the composition and form of clouds identified in Viking Orbiter images of Mars. It includes the location, season, cloud type and other parameters. Atmospheres is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

13. Navigation Software

Assuming that the the current NAIF software organization scheme were to be replicated within th PDS, there shall be be 30 catalog elements per piece of software. With about 250 pieces of software on the catalog, there shall be about 7,500 catalog elements. Navigation is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	N/A
Discipline Node Priority	Science:	N/A

14. Pioneer 10/11 Datasets

These data sets consist of reduced field and particle data sets which have been submitted to NSSDC by the Pioneer 10/11 investigators. FP is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Critical
Discipline Node Priority	Browse:	Critical
Discipline Node Priority	Science:	Nice

15. Pioneer 11 Saturn IPP Planetary Rings

The Pioneer 11 Saturn IPP Planetary-Rings data set consists of four tapes containing photopolarimeter images. Tapes contain the logistics (header) information, spacecraft command list, spacecraft attitude data, and data cycle intensities on separate files. Planetary-Rings is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

16. Planet Ephemeris

The principal content of the NAIF Planet Ephemeris data set is sets of Chebyshev polynomial coefficients which, when evaluated for a particular input time (ephemeris time) result in the planet state relative to the solar system barycenter.

The three component files and the composite file each contain polynomials for all of the planets, the sun, and the Earth's moon.

A utility program named SPLIT is available for creating a derived file containing data for only selected bodies and covering a reduced period of time. Actual size of data set(s) is about 1.25 megabytes. Navigation is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

17. Saturn Ring Atlas

The Saturn Ring Atlas includes radial profiles of Saturn Ring optical properties.

Radial profiles of Saturn ring opacity are presented at a resolution of approximately 50 kilometers for the following wavelengths:

1.3 x 10 -5 centimeter (UVS)

2.7 x 10 -5 (PPS)

3.6 centimeters (radio science)

13 centimeters (radio science)

Ring reflectance data (at a resolution of 5 x 10-5 centimeters) is also presented for two (2) geometries of ring viewing: transmission and reflectance. This data is a preliminary and greatly abridged version of a compilation and correlation of these Voyager data sets, which will be published as a PDS Ring node product. Planetary-Rings is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

18. Saturn Satellite Ephemeris

The Saturn Satellite Ephemeris data set consists of polynomial coefficients which are used to compute the location of a satellite at a particular time. Navigation is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

19. Selected Planetary Physical Constants

The Selected Planetary Physical Constants data set contains important constants of planetary bodies and systems. Only high level catalog data will be provided. There shall be four elements per constant. There will be approximately 15 instances for each of the 50 bodies involved yielding approximately 3000 elements, (4 x 15 x 50 = 3000) Navigation is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	N/A
Discipline Node Priority	Browse:	N/A
Discipline Node Priority	Science:	N/A

20. Viking IRTM Data

The Viking IRTM Data data set consists of Viking Infrared Thermal Mapper data. It is approximately 600 Megabytes in size. High Level Catalog information will be provided. Two forms of the Low-level catalog information will be implemented for version 1.0. The first is a 10 by 10 lat/lon binning of the sequence names and ID's. The second will be a set of all sequence and orbit headers. Both of these forms shall be browseable. The dataset itself can be accessed via the XG system through Flagstaff, with or without TAE. The dataset can also be ordered for tape delivery through Flagstaff. Radiometry is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Important

21. Viking IRTM Help Files

The Viking IRTM Help Files dataset consists of ASCII text VAX help files describing the IRTM data and relevant conventions and processing. It would be desirable to have these files directly accessible from the High Level Catalog. This data set is also on line at the Flagstaff VAX system. Radiometry is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	N/A
Discipline Node Priority	Browse:	N/A
Discipline Node Priority	Science:	N/A

22. Viking MAWD

The Viking MAWD data set consists of Viking Mars Atmosphere Water Detection data set. The data set is about 10 Megabytes in size. High Level Catalog information will be provided. For version 1.0, Low Level Catalog data will be found only at the LASP Britton Lee. Data can be ordered through LASP. Atmospheres is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Important

23. Viking MAWD Help Files

The Viking MAWD Help Files data set consists of Help files describing the Viking Mars Atmosphere Water Detection data set. Atmospheres is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	N/A
Discipline Node Priority	Browse:	N/A
Discipline Node Priority	Science:	N/A

24. Viking Picture Catalog

The Viking Picture Catalog provides image identification parameters which will be used to populate both the high and low level catalog. RPIF W is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Critical
Discipline Node Priority	Browse:	N/A
Discipline Node Priority	Science:	N/A

25. Viking SEDR

The Viking SEDR data set consists of Viking orbiter supplementary experiment data record containing image event timing and pointing information. The SEDR data will be used to populate both the High Level Catalog and the Low Level Catalog for planetary images. RPIF J is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	N/A
Discipline Node Priority	Science:	N/A

26. Voyager Additional Jup/Sat Data

This data set includes reduced data sets from other Voyager investigations which are required to support analysis of fields and particles data sets. FP is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Important
Discipline Node Priority	Science:	Nice

27. Voyager ISS Ring Jupiter

Images obtained by both Voyager 1 and 2 imaging system of Jupiter's ring. Voyager and 1 and 2 cameras were able to obtain images of Jupiter's ring observing in the forward scattering mode. Planetary-Rings is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Important
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Nice

Discipline Node Priority	Science:	Important

28. Voyager ISS Ring Saturn

The Voyager ISS Ring Saturn data set includes radio profiles of ring albedo for several wavelengths of about 3000 to 6000 angstroms and combinations of lighting and viewing geometry including both the illuminated and unilluminated surfaces acquired by the Voyager imaging systems. Azimuthal and time resolved profiles of ring albedo have also been derived from the imaging data. Planetary-Rings is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Critical

29. Voyager 1 Fluxgate Magnetometer

The Voyager-1 Fluxgate Magnetometer data set consists of 7 magnetic tapes containing calibrated, edited fluxgate magnetometer data which has been processed to remove offsets and to calibrate the data in nanoTeslas. The calibrated data has been produced for three averaging intervals: 1.92 seconds, 9.6 seconds, and 56 seconds. The data is available in both heliographic or -(minus) System III coordinates. FP is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Critical
Discipline Node Priority	Browse:	Critical
Discipline Node Priority	Science:	Important

30. Voyager 1 Low Energy Charged Particles

The Voyager-1 Low Energy Charged Particles data set consists of low energy charged particles data set containing the rate of particles of energy species striking the detector per unit time, and differential and integral flux measurements. FP is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Critical
Discipline Node Priority	Browse:	Critical
Discipline Node Priority	Science:	Important

31. Voyager 1 Plasma Data

The Voyager-1 Plasma Data data set consists of 2 tapes containing measurements of current as a function of energy which have been calibrated in femptoamps. Plots of current versus energy are produced for both electrons and ions. The spectra are integrated to find moment ion and electron densities and electron temperatures. FP is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Critical
Discipline Node Priority	Browse:	Critical
Discipline Node Priority	Science:	Important

32. Voyager 1 Plasma Wave Data

This data set consists of observations made by the Voyager 1 Plasma Wave instrument. The data are measurements of wave amplitudes as a function of frequency and time in units of electric field or electric field spectral density. FP is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Critical
Discipline Node Priority	Browse:	Critical
Discipline Node Priority	Science:	Important

33. Voyager 1 RSS Occultation Saturn Rings

The Voyager-1 RSS Occultation Saturn Rings data set contains Voyager 1 Radio science subsystem ring occultation data for Saturn.

The Voyager-1 RSS Occultation Saturn Rings data set includes radio profiles of optical thickness at 3.6 centimeters and 13 centimeters using the Voyager 1 spacecraft radio signal as the source and Earth-based telemetry antennaes as receivers. Planetary-Rings is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Critical

34. Voyager 1 Trajectory (Launch Sat)

The Voyager-1 Trajectory data set consists of any one or three data sets, each having 7 catalog elements describing the Voyager 1 trajectory. The total size of data set(s) 60 kilobytes. Navigation is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

35. Voyager 2 PPS Ring Occultation Saturn

The Voyager-2 PPS Ring Occultation Saturn data set consists of Voyager 2 Photopolarimeter subsystem ring occultation data for Saturn. The Voyager-2 PPS Ring Occultation Saturn data set includes radio profiles of optical thickness at about 2.6 x 10-5 centimeters using the star light (delta Scorpii) as the source and the Voyager photopolarimeter instrument as receivers. Planetary-Rings is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Critical

36. Voyager 2 Trajectory (Launch Nep)

The Voyager-2 Trajectory data set consists of any one or four data sets, each having 7 catalog elements. The total size of the data set(s) is about 750 kilobytes. Navigation is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

37. Voyager 2 UVS Ring Occultation Saturn

The Voyager-2 UVS Ring Occultation Saturn data set consists of Voyager 2 Ultraviolet Spectrometer subsystem ring occultation data for Saturn. Planetary-Rings is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Critical
Central Node Priority	Low-Level Catalog:	Important
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Critical

38. Viking Lander General Data

The Viking-Lander General Data data set consists of the Viking Lander Master Data Record. It contains complete set of all Viking Lander telemetry data records. It shall be converted to a 6250bpi format by University of Washington, for inclusion in the Planetary Data Archive. Viking-Lander is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

39. Viking Lander Meteorology Data

The Viking-Lander Meteorology Data data set consists of Mars meteorology data from Viking Lander 1 and 2. It consists of less than 1 megabyte of data. It is available on a RTI2000 optical disc. ATMOS/VL is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	Nice
Central Node Priority	Low-Level Catalog:	Nice
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Nice

40. Viking Survey Mission Images

The Viking Survey Mission Images data set consists of Viking Survey Mission images. It contains about 10,000 images, each image is about 1.7 Megabytes in size (including engineering data). High Level Catalog and Low Level Catalog are part of VSEDR and V-Picture catalogs. Digital imaging data available for distribution through the Image Archive, or used locally at the Washington University RPIF. Local users at RPIF-W can browse the data set using analog videodisk. RPIF W is the prototype discipline/data node responsible for this data.

Central Node Priority	High-Level Catalog:	N/A
Central Node Priority	Low-Level Catalog:	N/A
Discipline Node Priority	Browse:	Nice
Discipline Node Priority	Science:	Critical

D Functional Prioritization

PDS DEVELOPEMENT PRIORITIES

Task Name	DFD Number	Section Number	Prior	Auto	Node
Access-System	F-1	3.1.4.1	C	A	C
Support Communications	F-1.1	3.1.4.1.1	C	A	C
Support-Interactive-Users	F-1.1.1	3.1.4.1.1.1	C	A	C
Support-Data-Transfer-Protocol	F-1.1.2	3.1.4.1.1.2	I	A	C
Support-System-Security	F-1.1.3	3.1.4.1.1.3	C	A	C
Support-Local-Users	F-1.1.4	3.1.4.1.1.4	C	A	C
Support-SPAN-Network	F-1.1.5	3.1.4.1.1.5	C	A	C
Support-Dial-In-Users	F-1.1.6	3.1.4.1.1.6	C	A	C
High-Level-User-Interface	F-1.2	3.1.4.1.2	C	A	C,W
Route-Input	F-1.2.1	3.1.4.1.2.1	C	A	C
Manage-Menu	F-1.2.2	3.1.4.1.2.2	C	A	C
Interpret-Menu-Input	F-1.2.3	3.1.4.1.2.3	C	A	C
Interpret-Command	F-1.2.5	3.1.4.1.2.4	C	A	C
Start-Process	F-1.2.6	3.1.4.1.2.5	C	A	C
Execute-System-Request	F-1.2.7	3.1.4.1.2.6	C	A	C
Communicate-with-Process	F-1.2.8	3.1.4.1.2.7	C	A	C
Manage-Command-Help-Request	F-1.2.9	3.1.4.1.2.8	C	A	C
Transfer-Data	F-1.3	3.1.4.1.3	I	A	C
Control-Online-Data-Transfers	F-1.3.1	3.1.4.1.3.1	I	A	C
Process-Mail	F-1.4	3.1.4.1.4	I	A	C
Process-Mail-Command	F-1.4.1	3.1.4.1.4.1	C	A	C
Retrieve-Mail	F-1.4.2	3.1.4.1.4.2	C	A	C
Store-Mail	F-1.4.3	3.1.4.1.4.3	C	A	C
Inspect-Data	F-2	3.1.4.2	C	A	C
Retrieve-Inspect-Data	F-2.1	3.1.4.2.1	C	A	C
Interpret-Retrieve-Command	F-2.1.1	3.1.4.2.1.1	C	A	C
Retrieve-DBMS-Data	F-2.1.4	3.1.4.1.2	C	A	C
Retrieve-Non-DBMS-Data	F-2.1.7	3.1.4.2.1.3	C	A	C
Display-Data	F-2.3	3.1.4.2.2	C	A	C
Interpret-Display-Command	F-2.3.1	3.1.4.2.2.1	C	A	C
Display-Text	F-2.3.2	3.1.4.2.2.2	C	A	C
Display-Graph	F-2.3.3	3.1.4.2.2.3	I	A	F
Display-Image	F-2.3.4	3.1.4.2.2.4	I	A	R
Manipulate-Inspect-Data	F-2.5	3.1.4.2.3	I	A	C,L,F,R
Interpret-Manipulate-Command	F-2.5.1	3.1.4.2.3.1	I	A	C
Statistical-Functions	F-2.5.2	3.1.4.2.3.2	I	A	F
Sample-Data	F-2.5.3	3.1.4.2.3.3	I	A	F,L
Convert-Data	F-2.5.4	3.1.4.2.3.4	I	A	F,L
Image-Processing	F-2.5.5	3.1.4.2.3.5	I	A	R
Interpret-Inspect-Commands	F-2.7	3.1.4.2.6	C	A	C
Parse-Command/Prepare-Response	F-2.7.1	3.1.4.2.6.1	C	A	C
Route-Parsed-Commands	F-2.7.2	3.1.4.2.6.2	C	A	C
Order-Data	F-3	3.1.4.3	I	I	C
Verify-User-Info-Complete	F-3.1	3.1.4.3.1	I	A	C
Accept-Order	F-3.2	3.1.4.3.2	I	A	C
Select-On-Line-Orders	F-3.3	3.1.4.3.3	I	A	C
Prepare-Hardcopy-Order	F-3.4	3.1.4.3.4	I	A	C
Extract-User-Information	F-3.5	3.1.4.2.5	I	A	C
Interpret-Order-Commands	F-3.6	3.1.4.3.6	I	A	C
Extract-Data-Definition	F-3.7	3.1.4.3.7	I	A	C
Verify-Data-Definition-Correct	F-3.8	3.1.4.3.8	I	A	C

D Functional Prioritization

P D S D E V E L O P E M E N T P R I O R I T I E S

Task Name	DFD Number	Section Number	Prior	Auto	Node
Distribute-Data	F-5	3.1.4.4	I	A	C
Send-Order-Confirmation-Mail	F-5.2	3.1.4.4.1	I	A	C
Process-Order-Manually	F-5.3	3.1.4.4.2.1	C	M	D
Retrieve-Ordered-Data	F-5.4	3.1.4.4.3	I	A	C
Retrieve-Order-DBMS-Data	F-5.4.3	3.1.4.4.3.1	I	A	C
Interpret-Order-Retrieve-Cmd	F-5.4.5	3.1.4.4.3.2	I	A	C
Retrieve-Order-Non-DBMS-Data	F-5.4.7	3.1.4.4.3.3	N	A	C
Remove-Pending-Order	F-5.5	3.1.4.4.4	I	A	C
Distribute-Data-Online	F-5.9	3.1.4.4.5	I	A	C
Administer-System	F-6	3.1.4.5	C	M	C
Customer-Support	F-6.1	3.1.4.5.1	C	M	C
Route-User-Request	F-6.1.1	3.1.4.5.1.1	C	M	C
Register-Users	F-6.1.2	3.1.4.5.1.2	C	M	C
Consult-on-System-Usage	F-6.1.3	3.1.4.5.1.3	I	M	C
Consult-on-Data-Usage	F-6.1.4	3.1.4.5.1.4	I	M	C
Prepare-User-Ed-Manual	F-6.1.5	3.1.4.5.1.5	C	M	C
Access-User-Inquiry-Mail	F-6.1.6	3.1.4.5.1.6	C	M	C
Planning-and-Scheduling	F-6.2	3.1.4.5.2	N	M	C
Accounting	F-6.3	3.1.4.5.3	N	M	C
Administer-Data	F-6.4	3.1.4.5.4	C	I	C
Maintain-Storage-Hierarchy	F-6.4.1	3.1.4.5.4.1	C	M	C
Maintain-Archive	F-6.4.2	3.1.4.5.4.2	C	M	C
Maintain-Online-PSD	F-6.4.3	3.1.4.5.4.3	C	I	C
Maintain-Data-Integrity	F-6.4.4	3.1.4.5.4.4	C	M	C
Monitor-Data-Accounting	F-6.4.5	3.1.4.5.4.5	I	I	C
Acquire-Data	F-6.4.6	3.1.4.5.4.6	I	M	C
Acquire-System-Software	F-6.4.7	3.1.4.5.4.7	I	M	C
Facilities	F-6.5	3.1.4.5.5	I	M	C
Prepare-Data	F-7	3.1.4.6	I	M	C,S
Check-Data-Format	F-7.1	3.1.4.6.1	I	M	C,S
Evaluate-Format	F-7.1.1	3.1.4.6.1.1	I	M	C,S
Review-Data-for-Correct-Format	F-7.1.2	3.1.4.6.1.2	I	M	C,S
Check-Documentation	F-7.1.3	3.1.4.6.1.3	I	M	C,S
Evaluate-Correctability	F-7.1.4	3.1.4.6.1.4	I	M	C,S
Convert-Media	F-7.1.5	3.1.4.6.1.5	I	M	C,S
Reformat-to-Standard	F-7.1.6	3.1.4.6.1.6	I	M	C,S
Convert-Data-Type	F-7.1.7	3.1.4.6.1.7	N	M	C,S
Check/-Sample-Data-Content	F-7.2	3.1.4.6.2	N	M	C,S
Check-Data-Continuity	F-7.2.1	3.1.4.6.2.1	N	M	C,S
Check-Parameter-Range	F-7.2.2	3.1.4.6.2.2	N	M	C,S
Review-by-Experts	F-7.2.3	3.1.4.6.2.3	N	M	C,S
Validate-Software	F-7.3	3.1.4.6.3	N	M	C,S
Evaluate-Software-Completeness	F-7.3.1	3.1.4.6.3.1	N	M	C,S
Evaluate-Software-Quality	F-7.3.2	3.1.4.6.3.2	N	M	C,S
Administer-S/W-Evaluation	F-7.3.3	3.1.4.6.3.3	N	M	C,S
Test-Science-Data-Software	F-7.3.4	3.1.4.6.3.4	N	M	C,S
Convert-Science-Data-Software	F-7.3.5	3.1.4.6.3.5	N	I	C
Review of Data By Peers	F-7.4	3.1.4.6.4	N	M	C
Schedule-Review	F-7.4.1	3.1.4.6.4.1	N	M	C
Prep-+-Dist-of-Rvw-Materials	F-7.4.2	3.1.4.6.4.2	N	M	C

D Functional Prioritization

P D S D E V E L O P E M E N T P R I O R I T I E S

Task Name	DFD Number	Section Number	Prior	Auto	Node
Conduct-Review	F-7.4.3	3.1.4.6.4.3	N	M	C
Evaluate-Review-Results	F-7.4.4	3.1.4.6.4.4	N	M	C
Store-Data	F-7.5	3.1.4.6.5	C	I	C
Extract-Data	F-7.5.1	3.1.4.6.5.1	C	I	C
Prepare-Catalog-Data	F-7.5.2	3.1.4.6.5.2	I	I	C
Prepare-Sample/-Summary-Data	F-7.5.3	3.1.4.6.5.3	I	I	C
Prepare-Science-Data	F-7.5.4	3.1.4.6.5.4	I	I	C
Prepare-Software-Library	F-7.5.5	3.1.4.6.5.5	I	I	C
Prepare-Ancillary-Data	F-7.5.6	3.1.4.6.5.6	I	I	C
Service-Data-Storage-Requests	F-7.5.7	3.1.4.6.5.7	C	A	C
Service-Data-Staging-Requests	F-7.5.8	3.1.4.6.5.8	I	I	C

Legend:

Priority:
- C Critical
- I Important
- N Nice

Automation:
- A Fully Computerized Function
- I Interactive Function
- M Manual Function

Nodes:
- C Central Node (JPL)
- D All Data Nodes
- S All Data Suppliers
- F Fields and Particles (UCLA)
- L Laboratory of Atmospheric Space Physics
- W Washington University
- R RPIF (JPL)

E Project Organization

The proposed project structure during the development phase is provided in this appendix.