209-CD-002-005

EOSDIS Core System Project

Interface Control Document Between EOSDIS Core System (ECS) and ASTER Ground Data System

January 1997

Hughes Information Technology Systems
Upper Marlboro, Maryland

Interface Control Document Between EOSDIS Core System (ECS) and ASTER Ground Data System

January 1997

Prepared Under Contract NAS5-60000
CDRL Item 029

SUBMITTED BY

	1-31-97
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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ECS contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

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Abstract

This Interface Control Document (ICD) defines the functional and physical design of each interface between ECS and the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Ground Data System (GDS), and includes the precise data contents and format for each interface. All modes (options) of data exchange for each interface are described as well as the conditions required for each mode or option. Additionally, data rates, duty cycles, error conditions, and error handling procedures are included. Communications protocols and physical media are detailed for each interface.

This ICD is consistent with the ECS/ASTER GDS interface requirements, as described in the ASTER Memoranda of Understanding (MOU), the ASTER Project Implementation Plan (PIP), the Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements, the Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS Level 3 requirements), and the Interface Requirement Document (IRD) Between ECS and MITI ASTER GDS.

Keywords: ASTER, Japan, ICD, interface, EDC, EBnet, International Partner, AM-1, DAR, IST, interoperability, EOC, ICC, DCE, SNMP

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209-CD-002-005	Baselined Final	January 1997	96-1462

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1. Introduction

1.1 Identification

This Interface Control Document (ICD), Contract Data Requirement List (CDRL) item 029, whose requirements are specified in Data Item Description (DID) 209/SE1, is a required deliverable under the Earth Observing System (EOS) Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000).

1.2 Scope

This ICD defines all of the system interfaces that exist between ECS and the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Ground Data System (GDS).

ECS Releases are keyed to mission support: Release Ir1 provides support to the Tropical Rainfall Measuring Mission (TRMM) Early Interface Testing and Science Algorithm I&T. Release A provides support to TRMM Science Operations and TRMM Ground Systems Certification Testing. Release A also provides the functional capabilities needed to support early ESDIS Ground System Testing for the EOS AM-1 and Landsat 7 missions. Release B provides support to EOS AM-1 Mission Operations and Science Operations, and provides support to ESDIS Ground System Certification Testing for the EOS AM-1 and Landsat 7 missions. Release B also provides archive and distribution services for the Landsat 7 mission. Releases C and D provide evolutionary enhancements to the ECS services provided in the earlier Releases.

The ESDIS Project has joint responsibility with the ASTER GDS Project for the development and maintenance of this ICD. Any changes in the interface must be agreed to by the relevant participating parties, and then assessed at the ESDIS Project Level. This ICD will be approved under the signatures of the ESDIS and the Earth Remote Sensing Data Analysis Center (ERSDAC) ASTER GDS Project Managers.

This document reflects the technical baseline maintained by the ECS Configuration Control Board in accordance with ECS technical direction (see Section 2.2).

1.3 Purpose and Objectives

This document is written to formalize the interpretation and general understanding of the interface between ECS and the ASTER GDS. This document provides clarification and elaboration of the ECS-ASTER GDS interfaces to the extent necessary to assure hardware, software, and operational service compatibility within the end-to-end system.

This document provides a point of mutual control of external interface definitions by ESDIS and the ASTER GDS Project.

1.4 Status and Schedule

This is the final baseline version of the ICD for the definition of interfaces between the ECS and the ASTER GDS.

A Work-Off Plan for any TBD, TBR, and TBS items associated with the ECS implementation has been included in Appendix A. This Work-Off Plan provides the following information:

a. ICD I/F Issue Number

b. ICD Reference Paragraph

c. ICD Issue Priority

d. ICD Issue Type - Description

e. Work-off Plan Task(s)

f. Projected Resolution Date

g. Risk Assessment

Appendix B contains the ODL Message Keywords (Objects)

Appendix C contains the ASTER-GDS IMS DAR Client API List.

Appendix D contains the ASTER Level 1 Data Product Specification (GDS Version)

This ICD will now be submitted as a Configuration Control Board (CCB) approval Code 1 document. At the option of the ESDIS Project, this document may be designated to be under full ESDIS CCB control. Changes may be submitted for consideration by Contractor and ESDIS CCBs under the normal change process at any time.

1.5 Organization

This document is organized in 9 sections plus appendices. Section 2 contains information about documentation relevant to this ICD, including parent, applicable, and information documents. Section 3 provides an overview of the ECS-ASTER GDS interfaces, with a brief description of the interfaces involved. Section 4 provides an overview of the data exchange framework. Sections 5 through 9 contain descriptions of ECS-ASTER GDS data flows, including data format and content, the data transfer method(s), and error handling. Appendix A provides the Work-Off Plan supporting resolution of issues and closures of TBD, TBR and/or TBS items. Appendix B identifies and defines ODL Message Keywords (Objects), Appendix C provides the ASTER DAR Client API List, and Appendix D contains the ASTER Level 1 Data Products Specifications (GDS Version). Acronyms and abbreviations are also included.

1.6 Document Change Procedure

Changes to the terms and conditions of this document can be initiated by either party and changed only by mutual agreement of both parties. Proposed changes to this document must be approved by both the NASA ESDIS Project and ASTER Project CCBs. The EDIS Project CCB responsibility for this document is established in accordance with the requirements of the Earth Observing System Configuration Management Plan, 420-02-02. The ASTER Project CCB responsibility for this document is established in accordance with the requirements of the document , ERSDAC AG-E-S-0004.

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2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content derive:

193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
304-CD-001-003	Flight Operations Segment (FOS) Requirements Specification for the ECS Project, Volume 1: General Requirements
304-CD-004-003	Flight Operations Segment (FOS) Requirements Specification for the ECS Project, Volume 2: AM-1 Mission Specific
304-CD-005-001	Release B SDPS/CSMS System Requirements for the ECS Project
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)
423-41-18	Goddard Space Flight Center, Interface Requirements Document Between Earth Observing System Data and Information System (EOSDIS) and MITI ASTER GDS Project
None	Memorandum of Understanding Between the United States National Aeronautics And Space Administration and the Ministry of International Trade and Industry of Japan concerning Cooperation in the Flight of the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on the NASA Polar Orbiting Platform and Related Support for an International Earth Observing System
None	Project Implementation Plan, Volume II - Ground Data System, Advanced Spaceborne Thermal Emission and Reflection Radiometer and ESDIS and EOS-AM Projects

2.2 Applicable Documents

The following documents are referenced herein and are directly applicable to this document. In the event of conflict between any of these documents and this document, this document shall take precedence.

209-CD-001-003	Interface Control Document Between the EOSDIS Core System (ECS) and the NASA Science Internet (NSI)

505-10-35	Data Format Control Document for the Earth Observing System (EOS) AM-1 Project Data Base
209-CD-005-005	Interface Control Document Between the EOSDIS Core System (ECS) and Science Computing Facilities (SCF)
220-CD-001-004	Communications Requirements for the ECS Project
305-CD-004-001	Overview of Release A SDPS and CSMS System Design Specification for the ECS Project
305-CD-012-001	Release A CSMS Communications Subsystem Design Specification for the ECS Project
305-CD-020-002	Overview of Release B SDPS and CSMS System Design Specification for the ECS Project
305-CD-021-002	Release B SDPS Client Subsystem Design Specification for the ECS Project
305-CD-022-002	Release B SDPS Interoperability Subsystem Design Specification for the ECS Project
305-CD-023-002	Release B SDPS Data Management Subsystem Design Specification for the ECS Project
305-CD-024-002	Release B SDPS Data Server Subsystem Design Specification for the ECS Project
305-CD-025-002	Release B SDPS Ingest Subsystem Design Specification for the ECS Project
305-CD-026-002	Release B SDPS Planning Subsystem Design Specification for the ECS Project
305-CD-028-002	Release B CSMS Communications Subsystem Design Specification for the ECS Project
305-CD-029-002	Release B CSMS System Management Subsystem Design Specification for the ECS Project
305-CD-030-002	Release B GSFC Distributed Active Archive Center Design Specification for the ECS Project
305-CD-033-002	Release B EDC Distributed Active Archive Center Design Specification for the ECS Project
305-CD-034-002	Release B ASF Distributed Active Archive Center Design Specification for the ECS Project
305-CD-035-002	Release B NSIDC Distributed Active Archive Center Design Specification for the ECS Project

305-CD-036-002	Release B JPL Distributed Active Archive Center Design Specification for the ECS Project
305-CD-037-002	Release B ORNL Distributed Active Archive Center Design Specification for the ECS Project
305-CD-038-002	Release B System Monitoring and Coordination Center Design Specification for the ECS Project
305-CD-040-001	Flight Operations Segment (FOS) Design Specification for the ECS Project (Segment Level Design)
305-CD-041-001	Flight Operations Segment (FOS) Planning and Scheduling Design Specification for the ECS Project
305-CD-042-001	Flight Operations Segment (FOS) Command Management Design Specification for the ECS Project
305-CD-043-001	Flight Operations Segment (FOS) Command Design Specification for the ECS Project
305-CD-048-001	Flight Operations Segment (FOS) User Interface Design Specification for the ECS Project
305-CD-049-001	Flight Operations Segment (FOS) Data Management Design Specification for the ECS Project
311-CD-002-004	Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project
210-TP-001-006	Technical Baseline for the ECS Project, 2/14/96
none	Goddard Space Flight Center, ECS Technical Direction No. 11, "PDR Technical Baseline," 12/6/94
CCSDS 301.0-B-2	Consultative Committee for Space Data Systems (CCSDS), Time Code Formats, Blue Book, Issue 2
CCSDS 641.0-B-1	Consultative Committee for Space Data Systems (CCSDS), Parameter Value Language Specification (CCSD0006), Blue Book
CCSDS 641.0-G-1	Consultative Committee for Space Data Systems (CCSDS), Report Concerning Space Data System Standards, Parameter Value Language - A Tutorial, Green Book
ISBN 1-884133-12-6	Jamsa Press, Internet Programming, K. Jamsa, Ph.D. and K. Cope
ISO 7498	International Organization for Standardization, Basic Reference Model for Systems Interconnection
RFC791	Internet Protocol, J. Postel

RFC793	Transmission Control Protocol, J. Postel
RFC821	Simple Mail Transfer Protocol (SMTP), J. Postel
RFC959	File Transfer Protocol, Internet Standards, J. Postel and J. Reynolds
RFC977	Network News Transfer Protocol: A Proposed Standard for the Stream-Based Transmission of News, B. Kantor, P. Lapsley
RFC1157	A Simple Network Management Protocol (SNMP), J. Case, M. Fedor, M. Schoffstall, J. Davin
RFC1213	Management Information Base for Network Management of TCP/IP-based Internets: MIB-II, K. McCloghrie and M. Rose
RFC1510	The Kerberos Network Authentication Service (V5), J. Kohl and B. Neuman
552-FDD-96/010R0UD0	Goddard Space Flight Center, Earth Observing System (EOS) - AM1 Flight Dynamics Facility (FDF)/ECS Interface Control Document
None	Fujitsu, Ltd., ASTER Level 1 Data Products Specification (Science Version)
609-CD-005-001	EOSDIS Core System Project, Flight Operations Segment (FOS) Operations Tools Manual for the ECS Project

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

194-201-SE1-001	Systems Engineering Plan for the ECS Project
194-202-SE1-001	Standards and Procedures for the ECS Project
205-CD-001-002	Science Users Guide and Operations Procedure Handbook
333-CD-003-002	SDP Toolkit Users Guide for the ECS Project
604-CD-001-004	Operations Concept for the ECS Project: Part 1 -- ECS Overview
604-CD-002-003	EOSDIS Core System Project, Operations Concept for the ECS Project: Part 2 -- Release B
604-CD-004-001	EOSDIS Core System Project, Operations Concept for the ECS Project: Part 2 -- FOS
814-RD-003-002	SDP Toolkit 5 Version Description Document (VDD) for the ECS Project
175-WP-001-001	HDF-EOS Primer for Version 1 EOSDIS for the ECS Project (White Paper)

194-TP-285-001	ECS Glossary of Terms
420-TP-001-005	Proposed ECS Core Metadata Standard, Release 2.0
343-TP-001-001	IST Capabilities Document for the ECS Project
None	ASTER Science Team, ASTER Functional Requirements for Mission Operations
None	Committee on Earth Observations Satellites (CEOS) Working Group on Data, Guidelines for an International Interoperable Catalogue System, Catalogue Subgroup Issue 2.1
None	Goddard Space Flight Center, Earth Observing System Mission Operations Concept Document
None	Operations Interface Control Document, Earth Observing System AM Spacecraft to Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER)

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3. Interface Overview

3.1 Interface Context

The ECS and the ASTER GDS work together to provide ground support for mission operations and science data processing for the ASTER instrument onboard the EOS AM-1 spacecraft. This support includes spacecraft and instrument mission operations (planning, scheduling, control, monitoring, and analysis), science data processing (data processing, distribution, and archival), and ground system communications and management. In addition, the ASTER GDS will be interoperable with ECS so that an EOSDIS user or ASTER GDS user will be able to view the data holdings and order production data of the other system.

Figure 3-1 presents a high level context diagram for the ECS/ASTER GDS interfaces. Note that the user interfaces for Data Search and Request and Data Product delivery in this diagram depict only the interfaces related to ECS/ASTER GDS data interoperability.

3.2 Pre-Mission Phase Interfaces

Some of the ECS-ASTER GDS interfaces described in this ICD occur during the pre-mission phase. These interfaces are primarily concerned with setup and configuration of the ground system data bases and interfaces prior to use in mission operations.

3.2.1 AOS-FOS Pre-Mission Phase Interfaces

For AOS-FOS interfaces, pre-mission interfaces begin after the delivery of the ECS IST software by NASA to ERSDAC, and subsequent installation of this software on an ASTER Operations Segment (AOS) host computer at the ASTER ICC. After the ICC is operational, the ASTER Instrument Operations Team (IOT) at the ASTER ICC uses the ECS IST interface to the EOC to submit ASTER Data Base Updates for Activity Definitions, Activity Constraint Definitions, Relative Time Command Sequences (RTCSs), and Command Procedures. These interfaces are described in Section 5 of this ICD. (Note that the ASTER instrument team delivers command and telemetry data base definitions directly to the AM-1 spacecraft vendor for pre-mission check-out. During the pre-mission phase, FOS will obtain this ASTER command and data base information from the AM-1 spacecraft vendor. The FOS will provide pre-mission PDB files to the AOS for verification prior to mission operations.)

3.3 Mission Phase Interface

Most of the ECS-ASTER GDS interfaces described in this ICD occur during the mission phase. These interfaces are concerned with day-to-day mission and science operations within ECS and ASTER GDS. Note that the interfaces concerned with setup and configuration of the ground configuration updates may occur throughout the lifetime of the AM-1 mission.

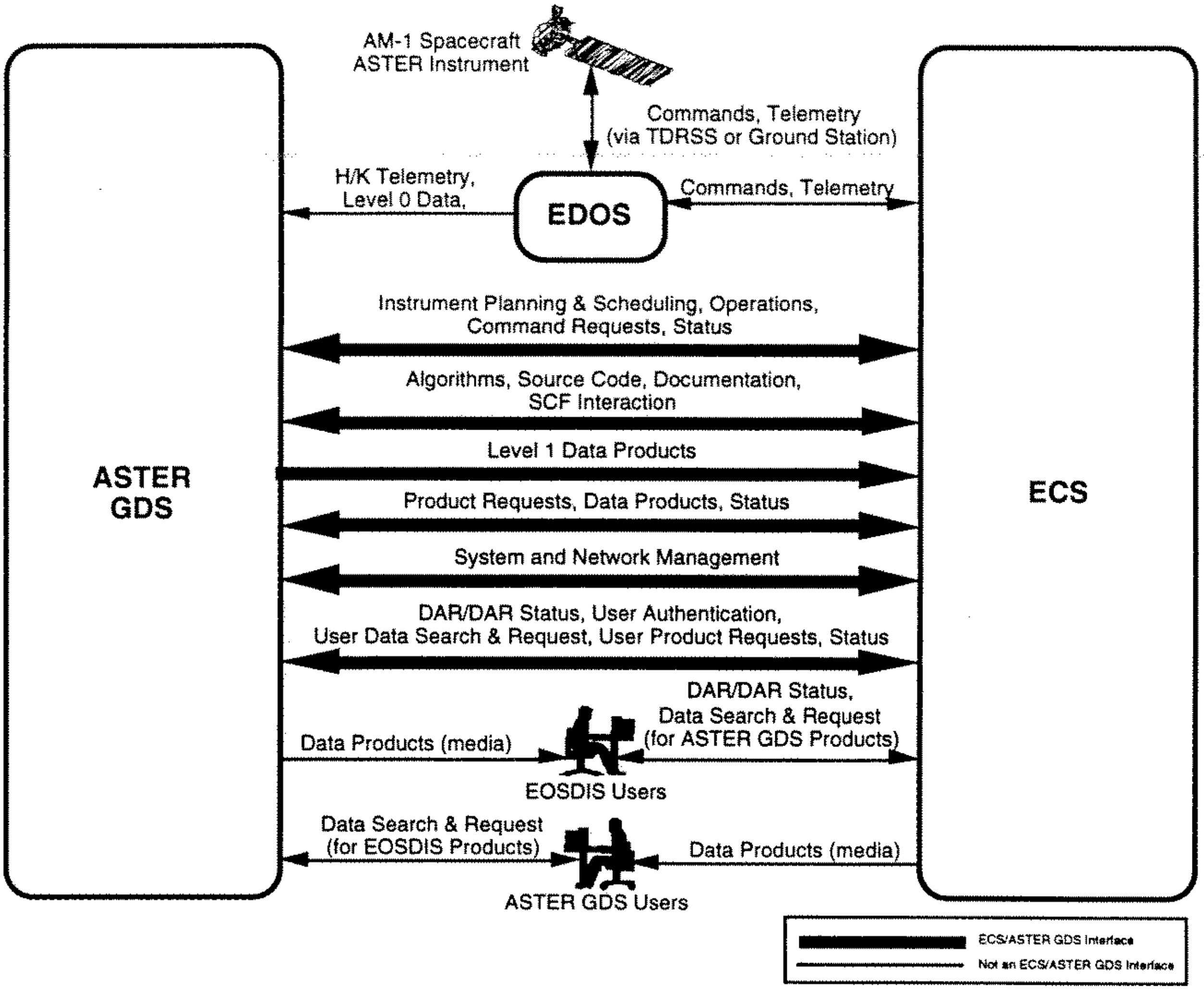

Figure 3-1. ECS/ASTER GDS Context Diagram

3.3.1 AOS-FOS Mission Phase Interfaces

AOS-FOS mission phase interfaces are described in Section 5 of this ICD.

As during the pre-mission phase, the AOT may submit ASTER Data Base Updates for Activity Definitions, Activity Constraint Definitions, Relative Time Command Sequences (RTCS), and Command Procedures. Updated ASTER command and telemetry definitions also may be submitted to FOS using the ECS IST interface. FOS will make the approved command and telemetry definitions for the AM-1 spacecraft and ASTER available to the AOS. The ASTER AOS may access EOC Project Data Base (PDB) either via the ECS IST interface (displays, reports) or via PDB text files that may be transmitted from the ECS IST to an ASTER AOS host. Procedures for coordination of PDB updates will be defined in the Operations ICD EOS AM Spacecraft to ASTER.

Mission phase interfaces include the exchange of planning and scheduling products for the ASTER instrument and the AM-1 spacecraft. The products exchanged include ASTER Short Term Schedules (STS), ASTER One Day Schedules (ODS), Preliminary Resource Schedules, Activity Schedules, Detailed Activity Schedules, Requests for EOC Schedules, and Planning Aids.

The ASTER Instrument Operations Team (IOT) also may use the ECS IST to access Absolute Time Command (ATC) Load Reports and Integrated Reports from FOS. These reports provide insight into the AM-1 stored command load and upcoming activities and commands that are planned for AM-1 operations.

The ASTER Instrument Operations Team (IOT) and the EOC Flight Operations Team (FOT) exchange products including Real Time Command Requests (submitted by the ASTER IOT to the EOC FOT) and instrument, spacecraft, and overall AM-1 mission status reports.

During the real time contact, FOS generates instrument real-time command notifications and instrument command uplink status (via event messages) whenever the EOC issues a real real time and historical event messages.time ASTER command to the AM-1 spacecraft. The IOT may use the ECS IST capabilities to access real time and historical event messages.

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4. Data Exchange Framework

4.1 Overview

Section 4 defines the data exchange framework for the network interfaces, message flows, and file transfers between ECS and the ASTER GDS. Section 4.2 describes the network topology. Section 4.3 describes the internetworking protocol standards that are used for data and information exchange. Section 4.4 addresses interface security. Sections 4.5 through 4.9 identify the protocols and handshaking control messages exchanged between ECS and ASTER GDS to accomplish the required data exchanges.

4.2 Physical Network Topology

In the U.S., the EOSDIS Backbone Network (EBnet) supports all network-communications between EOSDIS and the ASTER GDS.

In Japan, the ASTER Data Network (ADN) supports all network communications between EOSDIS and the ASTER GDS.

EBnet will develop the following ICDs to describe the details of the EBnet interfaces with ECS and ASTER GDS:

a. ICD Between EBnet and the EOS Operations Center (EOC)

b. ICD Between EBnet and the EOSDIS Distributed Active Archive Centers (DAACs)

c. ICD Between EBnet and the ASTER Ground Data System

EBnet and the ADN will each connect to a trans-Pacific link to provide connectivity for network communications between EOSDIS and the ASTER GDS. The ICD Between EBnet and the ASTER GDS will describe the EBnet interface to the trans-Pacific link. Internal ASTER GDS design documentation will describe the ADN interface to the trans-Pacific link. Operation and maintenance responsibility for the trans-Pacific link will be mutually agreed between the U.S. and Japan.

The ECS CSMS and DAAC Design Specifications describe the topology of ECS local networks (e.g., refer to Section 2.2 for a complete listing of ECS design specifications). The ICD Between EBnet and the EOC, and the ICD Between EBnet and EOSDIS DAACs will define EBnet's connectivity with the ECS.

A high-level network topology diagram for ECS-ASTER GDS mission critical communications is shown in Figure 4-1.

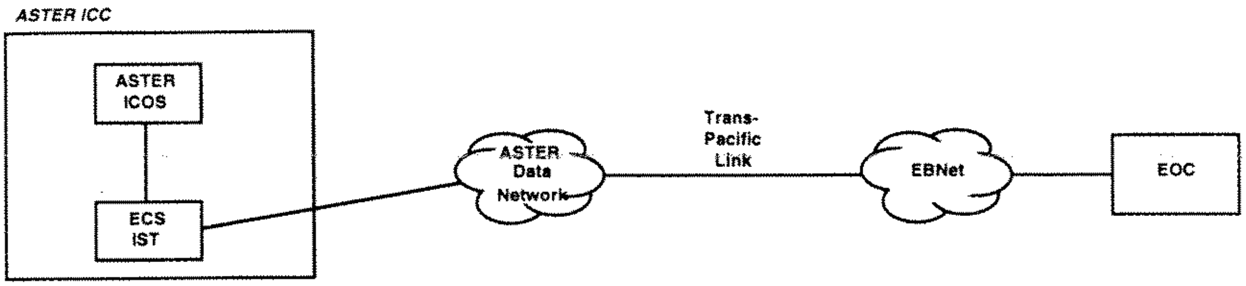

Figure 4-1. High Level Network Topology for Mission Critical Communications

4.3 Internetworking Protocols

Internetworking protocols supporting ECS-ASTER GDS data exchange are based on protocols and standards corresponding to the Open Systems Interconnection (OSI) reference model. These specifications are published in the International Organization for Standardization, Basic Reference Model of Systems Interconnection (Reference ISO 7498). These layered protocols also are described in "Internet Programming; Jamsa Press, 1995."

4.3.1 Internet Protocol (IP)

The Internet Protocol (IP), specified in RFC791, supports network layer data exchanges between ECS and the ASTER GDS. The network layer provides transparent transfer of data between transport entities. The IP addresses for ECS and ASTER GDS network nodes and workstations are determined at the time of installation.

4.3.2 Transmission Control Protocol (TCP)

Transmission Control Protocol (TCP) provides connection-oriented transport services between host computers. TCP, specified in RFC793, is a reliable end-to-end protocol designed to fit into a layered hierarchy of protocols which support multi-network applications. TCP provides for guaranteed delivery of data between host computers, as opposed to User Data Protocol (UDP), which is a connectionless-oriented transport service with no guaranteed delivery.

4.3.3 File Transfer Protocol (FTP)

File transfers between the ECS IST and ASTER GDS host computers are accomplished through the use of standard File Transfer Protocol (FTP).

EDS file transfer between GSFC DAAC in ECS and ADN in ASTER GDS CSMS is accomplished through the use of standard FTP.

Standard FTP services are described in RFC959.

4.3.4 Simple Mail Transfer Protocol (SMTP)

The protocol for e-mail transfer is the Simple Mail Transfer Protocol (SMTP). SMTP is described in RFC821. E-mail message formats are defined in RFC822.

4.3.5 Network News Transfer Protocol (NNTP)

ECS bulletin board services use the Network News Transfer Protocol (NNTP) for sending and receiving messages. ECS bulletin board services are a standard Internet application where messages are directed to all readers of a named group. NNTP is defined in RFC977.

4.4 Distributed Computing Environment (DCE) and Security

Network communications between ECS and the ASTER GDS will be accomplished via the EBnet. Neither ASTER GDS nor its host computers will provide external access to EOSDIS. EBnet, ECS, and the ASTER Data Network (ADN) will provide the packet filtering function. In addition, ECS also will perform port filtering. The detailed implementation is described in the EBnet ICD. End-to-end hosts will implement the respective security method as follows:

A standardized processing environment, Open System Foundation's (OSF) Distributed Computing Environment (DCE) services, will be used to maintain the security of the interfaces between ECS and ASTER GDS. DCE Security Services make use of configuration-controlled Access Control Lists (ACLs) and Kerberos authentication tools to maintain security for communications between ECS and ASTER GDS. ECS and ASTER GDS will use OSF DCE Version 1.1.

The ECS IST will host DCE client host software and will be configured as part of the EOC cell.

The ASTER GDS will host a copy of the ECS IST toolkit software on an ASTER GDS-provided workstation at the ASTER Instrument Control Center (ICC). Some data exchanges between the ASTER ICC and the EOC will be accomplished through the use of the ASTER ICC's ECS IST. The use of DCE and Kerberos security services in the EOC and the ASTER ICC's ECS IST toolkit supports reliable user authentication and ensures the security of the mission critical interfaces between the ECS EOC and the ASTER ICC.

DCE security services are not used for data transferred using e-mail services.

4.5 Data Exchange Between the ECS FOS and the ASTER GDS AOS

Some electronic data exchange between the ECS FOS and the ASTER GDS AOS will be accomplished through an ECS IST Toolkit hosted on an ASTER GDS-provided workstation at the ASTER ICC. The handshaking and higher level communications protocols for transferring data between the EOC and the ASTER ICC's ECS IST Toolkit are documented in ECS FOS design specifications (refer to Section 2.2 for a complete listing of applicable FOS design specifications). Network connectivity between the ASTER ICC's ECS IST and the EOC will be accomplished via mission-critical communications (EBnet) circuits.

The ASTER ICC may obtain the most recent versions of EOC schedules by sending a Request for EOC Schedules file to the ECS IST. The Request for EOC Schedules file results in the automatic delivery of an Activity Schedule file to the ASTER AOS. This Activity Schedule file covers the time frame requested in the Request for EOC Schedules file. The ASTER AOS may send a Request for EOC Schedules file to the ECS IST at any time during the scheduling process.

FOS automatically delivers Detailed Activity Schedule files to the ASTER AOS whenever these products are generated or updated by the FOS.

4.5.1.2 Message Sequence for Automated FTP

A generic message sequence applies for all automated FTP transfers between the FOS and the ASTER AOS. In this transfer sequence, the sender of the data initiates the communications session with the receiver. Using standard FTP, the sender transfers the data file to a specified directory on the receiving host computer. Immediately upon completion of the FTP of the data file, the sender sends a 'signal file' to the same directory on the receiving host computer.

The 'signal file' is used by the receiving host to identify the completion of the file transfer of the data file. The file name of the 'signal file' will be the same as the file name of the data file, except that the 'signal file' will have the additional extension field of "XFR". For example, if the ASTER AOS sends a data file named "ASTER_STS_1999028001.txt", the corresponding 'signal file' is named "ASTER_STS_1999028001.txt.XFR". Similarly, if the ECS IST sends a data file named "EOC_PRS_1999028003.txt", the corresponding 'signal file' is named "EOC_PRS_1999028003.txt.XFR".

4.5.2 Interfaces Supported by Operator Interaction with the ECS IST

Through use of the ECS IST's user interface, the ASTER IOT will have access to other FOS tools and capabilities for submitting PDB updates for ASTER (e.g., command, telemetry, activity, and constraint definitions), building command procedures, relative time command sequences, and real time command requests. These products are submitted to the FOS through the ECS IST user interface. (Refer to Figure 4-3.)

The ASTER AOS may access EOC Project Data Base (PDB) files either via the ECS IST interface (displays, reports) or via PDB text files that may be transmitted (by operator-initiated FTP) from the ECS IST to an ASTER AOS host.

(Note: Files transferred via operator-initiated FTP do not use the special message sequencing protocol that is used for automated FTP (i.e., 'signal files' are not used).

The IOT and other AOS host operators also will have access to ECS IST displays and EOC reports through the ECS IST user interface. This allows the ASTER IOT to use the ECS IST to access to EOC event messages for command notification and command load reports.

The ECS IST user interface also may be used by the IOT and other AOS operators to view EOC plans and schedules and to access FOS tools for requesting and viewing the results of command-level constraint analyses performed on 'what-if' analysis schedules by the FOS Command Management Subsystem.

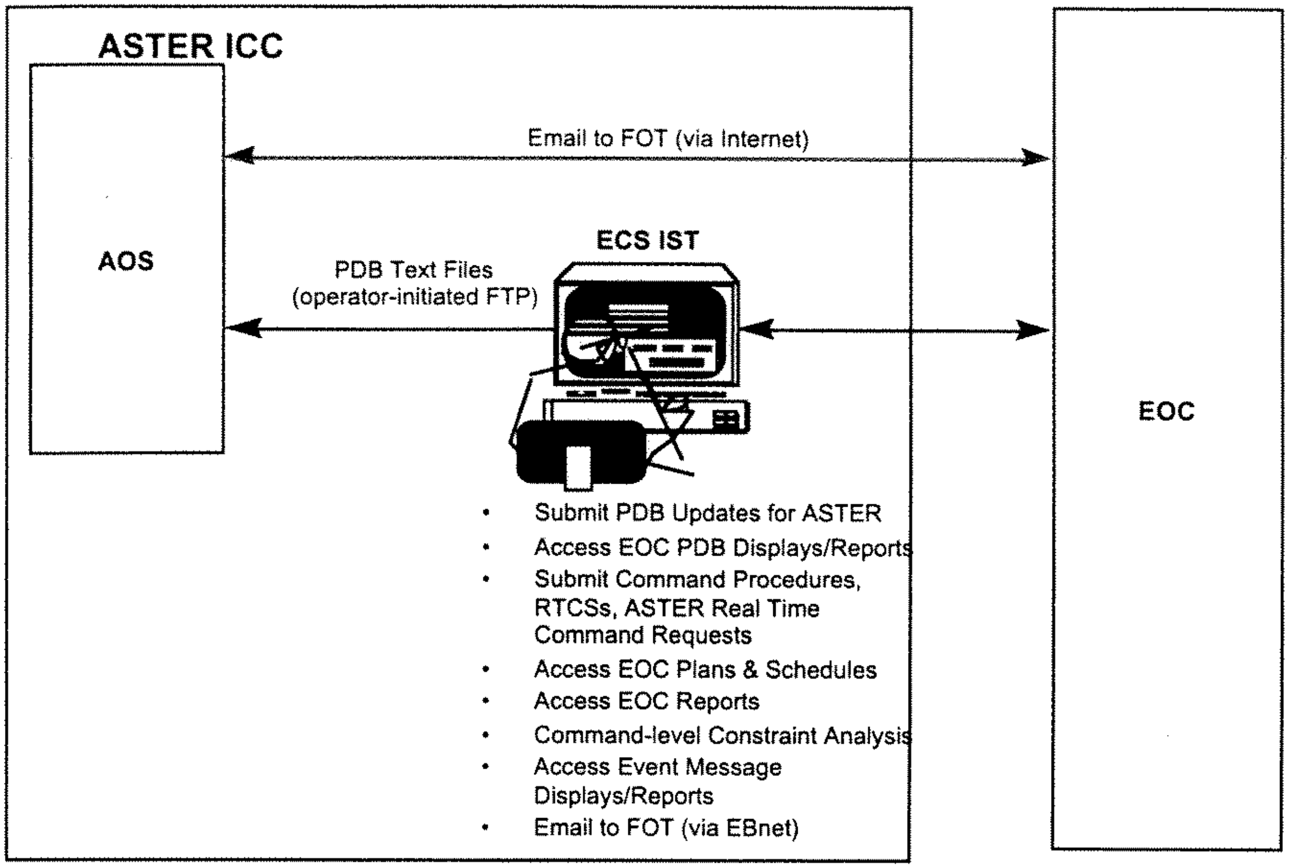

Figure 4-3. ECS IST Operator Interfaces

Details of the ECS IST user interface will be documented in the FOS Operations Manual for the ECS Project.

4.5.3 Email Exchange Between the ASTER ICC and the EOC

Operations status reports and inter-instrument coordination messages are exchanged between the ASTER IOT and the FOT via email. Two paths exist for the exchange of email between the ASTER ICC and the EOC. (Refer to Figure 4-3).

The ASTER IOT may use the ECS IST to exchange email (over EBnet circuits) with the FOT at the EOC. In this case, the email exchange is between the ASTER ICC's ECS IST and the FOT's EOC User Stations.

Optionally, the ASTER IOT use email services provided on an ASTER AOS host to exchange mail with the FOT via the Internet. In this case, the email exchange is between an ASTER AOS host computer and the FOT's off-line computers in the EOC.

Policies for email exchange will be documented in the Operations ICD EOS AM Spacecraft to ASTER.

4.6 Data Exchange Between the ECS SDPS and the ASTER GDS SDPS

4.6.1 ASTER Gateway: Information Manager

The interface between the ECS and the ASTER GDS Information Manager Subsystem (IMS), via the ASTER Gateway IM, supports two-way catalog interoperability to provide an exchange of data and information. Specifically, this interface supports the search, location and acquisition of data between ECS and the ASTER GDS IMS, providing ECS and ASTER GDS IMS users with ready access to the data and services provided by the other system. Figure 4-5 displays a high level context diagram for the catalog interoperability interfaces between ECS and the ASTER GDS. The specific catalog interoperability interfaces supported via the ASTER Gateway include the following:

a. directory search request/results - for finding data sets

b. inventory search request/results - for locating specific granules within a dataset

c. acknowledge - to acknowledge reception of inventory search results chunk

d. browse requests/responses - for enabling the user to retrieve/view "representative images, as well as non-image data.

e. product requests/results - placement of orders for full resolution data sets

f. quit - notification of premature termination of a session due to problems; also used at the normal termination of inventory results exchanges of chucks.

g. price estimate request/result - confirmation of price prior to product request.

h. product status request/information - confirmation of product processing status.

i. product Cancel request/response - cancellation by users.

The interface between the ASTER GDS IMS, and ECS, via the ASTER Gateway, uses Object Description Language (ODL) to implement the messaages shown in Figure 4-4.

a. The ASTER Gateway translates the ASTER GDS user's ODL service request into Object Oriented Distributed Computing Environment (OODCE); in addition, Illustra's version of SQL is used as the Earth Science Query Language (ESQL) for ECS.

b. Using OODCE/SQL, the ECS interfaces via the ASTER Gateway to the ASTER SDPS. To accommodate the interface to the ASTER SDPS, the ASTER Gateway first translates the ECS user's service request into ODL.

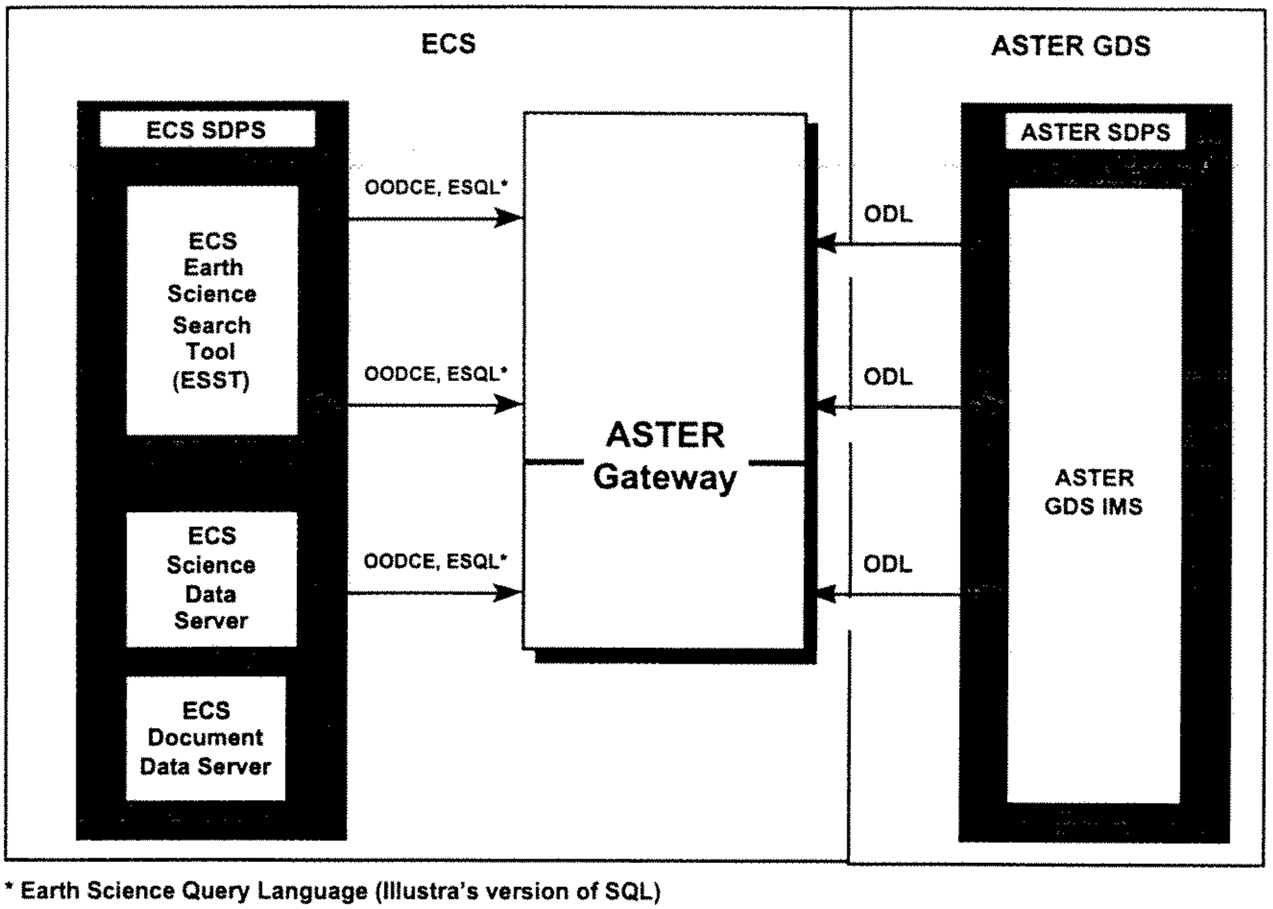

Figure 4-4. ECS/ASTER GDS IMS Interoperability via ASTER Gateway: Context Diagram

4.6.1.1 ASTER Gateway: Communications Gateway

The ASTER Communications Gateway is the software that is used to support all communications infrastructure necessary for two-way protocol conversion between TCP/IP sockets and DCE RPC to accommodate communications between the ASTER GDS IMS and ECS.

4.6.1.2 ASTER Gateway: Management Subsystem

The ASTER Gateway Management Subsystem (MSS) includes the management support functions needed within the ASTER Gateway to support the ECS-ASTER GDS IMS interfaces.

4.6.2 Data Acquisition Requests (DARs)

Data exchange between the ASTER GDS SDPS and the ECS SDPS for DARs will be accomplished via Application Programming Interfaces (APIs) to a DAR Client application which is integrated into the ECS SDPS Client. This DAR Client application will be developed by the ASTER GDS and provided to NASA for use in the ECS SDPS Client. The APIs provide the interface between the DAR Gateway and ASTER IMS DAR Server. The DAR Client API List is provided as Appendix C to this document.

The communications layer application between the DAR Client Application and the ASTER GDS DAR Server will consist of the ASTER GDS DAR Server communicating with the ASTER Gateway using existing protocol; the ASTER Gateway communicates via RPCs to ECS DAR clients.

Network connectivity for communications between the ECS and the ASTER GDS for DAR communications will be accomplished via EBnet circuits. **Note:** All DAR network traffic passes through an EBnet router in GSFC Building 32..

4.6.3 Delivery of ASTER Level 1A and Level 1B Products

The ASTER GDS will store Level 1A and Level 1B products on separate tapes. A total of three tapes will be shipped to EDC on a daily basis.

4.6.3.1 Level 1A Product File

ASTER Level 1A Product File Format is defined in the ASTER Level 1 Data Products Specification (GDS Version). Products will be shipped to EDC in the form of D3 tapes without any additional processing. Contents of Level 1A Product file are as follows:

a. The Product File and a Browse File will be produced for each scene.

b. The Product File will contain image data, ancillary data, supplement data, Generic Header, and a Specific Header.

4.6.3.2 Level 1B Product File

ASTER Level 1B Product File Format is defined in the ASTER Level 1 Data Products Specification (GDS Version). Products will be shipped to EDC in the form of D3 tapes without any additional processing. Contents of Level 1B Product file are as follows:

a. The Product File and Browse File (including Image) data, will be produced for each scene.

b. The Product File will contain Generic Header, and Specific Header.

Table 4-1 summarizes the contents of ASTER Level 1A and 1B Products for delivery.

Table 4-1. Level 1 Products

Product Category	Product
L1A	L1A products scheduled using L0 data as the source.
	Re-processed L1A Products
L1B	L1B products scheduled using L1A products which have been created on the previous production unit.
	L1B products scheduled in response to DPRs using existing L1A products.
	Re-processed L1B products

4.6.3.3 Data Shipping Notice

Prior to a delivery of ASTER Level 1A and 1B Products to EDC, ASTER GDS will e-mail a Data Shipping Notice to the EDC DAAC when the tapes for delivery have been completed.

4.6.3.4 D3 Tape Delivery

ASTER GDS will create a total of three D3 tapes daily. The total data stored on all three tapes will not exceed 158 GB (This is the uncompressed size). Since tapes may not be shipped by ASTER daily, ECS may receive none, or more than three tapes on any given day. The ASTER Level 1 Product Structure in D3 Tape is shown in Figure 4-5.

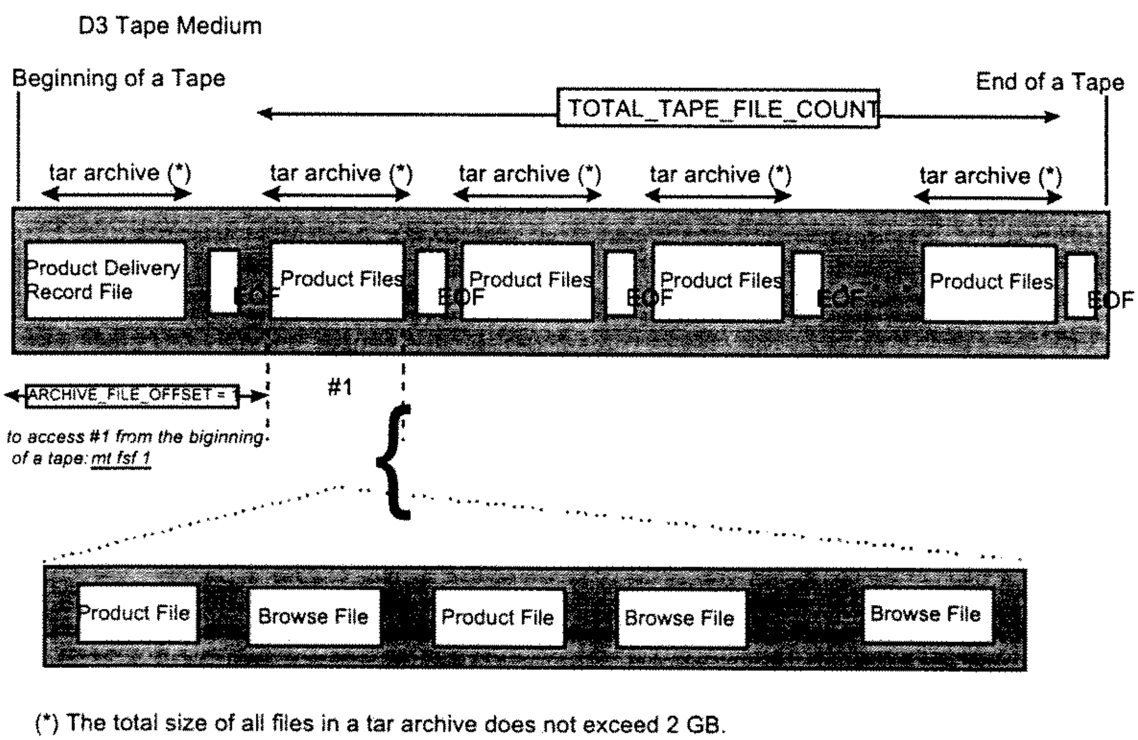

Figure 4-5. ASTER Level 1 Product Structure in D3 Tape

4.6.3.4.1 D3 Tape Storing Rules

The following storing rules apply to all ASTER Level 1A and Level 1B products delivered by the ASTER GDS to EDC on D3 tapes:

a. Files will be stored into D3 tapes by use of the UNIX tar command. The UNIX tar command will not use absolute path. To unpack all files in a TAR file, the following UNIX command can be used: mt fsf <archive file offset> + TAR xf <device> *

b. Files in D3 tape will be stored without any file directories.

c. The TAR archival unit for L1A Products will be the same as the processing unit of the PGS, which is a strip unit of observation. The archival unit for ECS is a Product FileIBrowse file pair. The Product File is for a scene of data.

d. The Product Delivery Record will contain the number of archives and the number of EOF skips for each file. Product Delivery Record will be contained in the first archive of the tape. The first archive will contain only the Product Delivery Record File.

e. Files will be stored on the D3 tape in chronological order within an archive. The storage order between tar archives can be of any order.

f. Level 1A and 1B Products will be stored on separate media.

g. D3 Tapes are always compressed by hardware.

h. All L1 re-processed products in a production unit (1 day) will be shipped.

4.6.3.5 Physical Media Format

4.6.3.5.1 Product Delivery Record File

The format of the Physical Media Product Delivery Record (PDR) is shown in Table 4-2.

The structure of Physical Media Product Delivery Record (PDR) is shown in Figure 4-6. An example of a Product Delivery Record PVL is shown in Figure 4-7.

4.6.3.6 Metadata

Product-Core Metadata and Product-Specific Metadata of ASTER-Level 1A and 1B products are defined in the ASTER Level 1 Data Product Specification (GDS Version). Each Metadata will be stored in the Product File. In addition to the Metadata in the Product File, XAR information (XAR ID, XAR Type) will be stored in the Product Delivery Record as described in Table 4-2.

4.6.3.7 Browse

Browse data of the ASTER-Level 1A and 1B products will be defined in the ASTER Level 1 Data Products Specification (GDS Version).

Table 4-2. Format of Product Delivery Record

Parameter	Contents	PVL Data Type	Max Length (Bytes)t	Value
ORIGINATING_ SYSTEM	PDR originator	ASCII	20	Identifier of the processing facility in the ASTER GDS.
TOTAL_TAPE_FILE_ COUNT	The total number of TAR files included in the shipped tapes.	Integer	4	1-9999
TOTAL_FILE_COUNT	Total number of ProductlBrowseFiles	ASCII	4	1-9999
OBJECT	Start of ProductlBrowse File Pair Definition	ASCII	20	FILE_GROUP*
ARCHIVE_FILE_ OFFSET	Offset to the tar archive file which contains the target file (i.e., the number of EOFs to be skipped).	Integer ASCII	4	1-9999
DATA_TYPE	Data type. Registered ESDT short name for data.	ASCII	20	AST_L1'A, AST_L'1B
OBJECT	Start of File Parameters. Repeat for each File in the ProductlBrowse File Pair	ASCII	9	'FILE_SPEC'
DIRECTORY_ID	Directory name	ASCII	256	Blank Since TAR files on D3 tape do not unpack into subdirectories.
FILE_ID	File name follows ASTER GDS File Naming convention.	ASCII	256	The File ID of a ProductlBrowse File
FILE_TYPE	File data type.	ASCII	7	Science, Browse
FILE_SIZE	File size in Byte	ASCII Unsigned 32bit Integer	10	$<4.295 * 10^9$
END_OBJECT	End of parameters for each file.	-	-	'FILE_SPEC'
OBJECT	Start of XAR Info Entry.	ASCII	9	'XAR_ENTRY'
GRANULE_ID**	Granule ID defined by ASTER GDS (1) Newly processed Level 1A, (2) Updated Level 1	ASCII	TBD	TBD
XAR_INFO_COUNT	Number of XAR Information Objects	ASCII	TBD	TBD
OBJECT	Beginning of XAR Information, repeat for XAR_INFO_COUNT	ASCII	8	'XAR_INFO'
XAR_ID	XAR_ID	ASCII	TBD	TBD
XAR_TYPE	XAR_TYPE	ASCII	TBD	TBD
END_OBJECT	End of XAR Information	ASCII	9	XAR_INFO
END_OBJECT	End of XAR Information Entry	ASCII	9	XAR_ENTRY
END_OBJECT	End of parameters for each file group	-	-	'FILE_GROUP'

Legend:

* A File Group represents an ECS Granule. (A Granule is the smallest aggregation of data that can be inventoried with ECS and ordered from ECS). An ASTER Granule is a single Product File.

** There is no relationship between the XAR_GRANULE_ID and the Granule included in the D3 Tape.

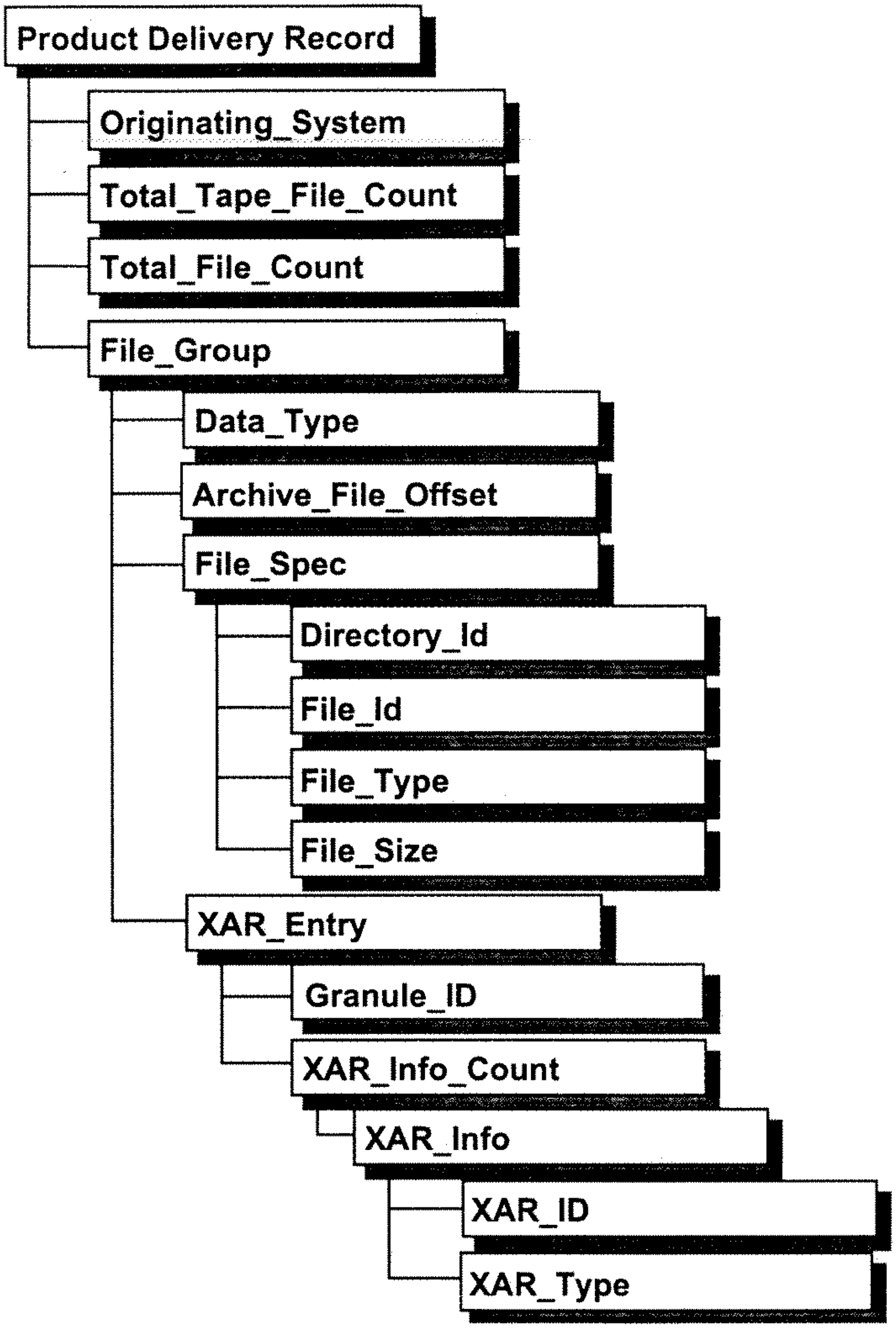

Figure 4-6. Structure of Physical Media PDR (level 1 cassette)

```
        ORIGINATING_SYSTEM = ASTERGDS;
        TOTAL_TAPE_FILE_COUNT = 3;
        TOTAL_FILE_COUNT = 9;
        OBJECT = FILE_GROUP;
                DATA_TYPE = AST_L1A , AST_L1B
                ARCHIVE_FILE_OFFSET = 1;
                OBJECT = FILE_SPEC:
                        DIRECTORY_ID = ;
                        FILE_ID = <aster HDF EOS file name>;
                        FILE_TYPE = SCIENCE;
                        FILE_SIZE = 242120;
                END_OBJECT = FILE_SPEC;
                OBJECT = FILE_SPEC:
                        DIRECTORY_ID = ;
                        FILE_ID = <aster browse file name>;
                        FILE_TYPE = BROWSE;
                        FILE_SIZE = 2098;
                END_OBJECT = FILE_SPEC;
OBJECT = XAR_ENTRY;
                        GRANULE_ID = <aster xar granule id>;
                        XAR_INFO_COUNT = 2
                        OBJECT = XAR_INFO;
                                XAR_ID = <aster xar id>;
                                XAR_TYPE =
                        OBJECT = XAR_INFO;
                                XAR_ID = <aster xar id>;
                                XAR_TYPE =
                        END_OBJECT = XAR_INFO;
                END_OBJECT = XAR_ENTRY;
        END_OBJECT = FILE_GROUP;
OBJECT = FILE_GROUP;
                DATA_TYPE = AST_L1A, AST_L1B
                ARCHIVE_FILE_OFFSET = 1;
                OBJECT = FILE_SPEC:
                        DIRECTORY_ID = ;
                        FILE_ID = <aster HDF EOS file name>;
                        FILE_TYPE = SCIENCE;
                        FILE_SIZE = 242120;
                END_OBJECT = FILE_SPEC;
```

Figure 4-7. Sample Product Delivery Record PVL (1 of 2)

```
                OBJECT = FILE_SPEC:
                        DIRECTORY_ID = ;
                        FILE_ID = <aster browse file name>;
                        FILE_TYPE = BROWSE;
                        FILE_SIZE = 2098;
                END_OBJECT = FILE_SPEC;
OBJECT = XAR_ENTRY;
                        GRANULE_ID = <aster xar granule id>;
                        XAR_INFO_COUNT = <aster xar id>;
                        OBJECT = XAR_INFO;
                                XAR_ID = <aster xar id>;
                                XAR_TYPE = <aster xar type>;
                        END_OBJECT = XAR_INFO;
                END_OBJECT = XAR_ENTRY;
        END_OBJECT = FILE_GROUP;
OBJECT = FILE_GROUP;
                DATA_TYPE = AST_L1A, AST_L1B
                ARCHIVE_FILE_OFFSET = 2;
                OBJECT = FILE_SPEC:
                        DIRECTORY_ID = ;
                        FILE_ID = <aster HDF file name>;
                        FILE_TYPE = SCIENCE;
                        FILE_SIZE = 2589510;
                END_OBJECT = FILE_SPEC;
                OBJECT = FILE_SPEC:
                        DIRECTORY_ID = ;
                        FILE_ID = <aster browse file name>;
                        FILE_TYPE = BROWSE;
                        FILE_SIZE = 3020;
                END_OBJECT = FILE_SPEC;
OBJECT = XAR_ENTRY;
                        GRANULE_ID = <aster granule id>;
                        XAR_INFO_COUNT = 1
                        OBJECT = XAR_INFO;
                                XAR_ID = <aster xar id >;
                                XAR_TYPE = <aster xar type>;
                        END_OBJECT = XAR_INFO;
                END_OBJECT = XAR_ENTRY;
        END_OBJECT = FILE_GROUP;
```

Figure 4-7. Sample Product Delivery Record PVL (2 of 2)

4.6.3.8 Data Shipping Notice

Prior to a delivery of ASTER Level 1A and 1B Products to EDC, ASTER GDS SDPS DADS will send a Data Shipping Notice by e-mail to the EDC DAAC when the tapes for delivery have been completed. The ASTER GDS SDPS DADS will transmit the Data Shipping Notices by e-mail to the ECS DAAC Operations Supervisor at EDC. In the event that an expected Data Shipping Notice is not received, the DAAC Operations Supervisor at EDC will inform the ASTER GDS SDPS DADS Operations Supervisor by telephone.

The structure and format of Data Shipping Notice to be used at DADS are depicted in Figure 4-8 and Table 4-3. Figure 4-9 contains the standard E-mail Header to be used.

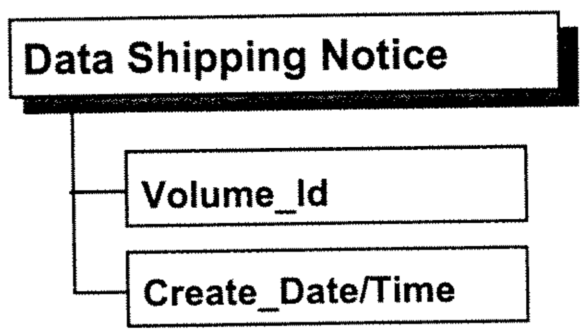

Figure 4-8. Structure of Data Shipping Notice

Table 4-3. Format of Data Shipping Notice

Parameter	Data Type	Byte	Content
VOLUME_ID	ASCII	-	Bar Code Follows ASTER standard Table 4-4
CREATE_DATE/TIME	ASCII	20	Date (GMT) Date/Time when tape generation began; yyyy-mm-ddThh:mm:ssZ, where T indicates start of time information and Z indicates "Zulu" time.

```
E-mail Contents Header
BEGIN_OBJECT=GDS_Header;        /* Message Sequential Number  0 ~ 999999999(dec) */
Message_Number=123456789;       /* Re-entarant Check Flag  "Yes", "No" */
ReEntrantCheck=Yes;             /* Sender ID  ECS, GDS */
Sender_ID=GDS;                  /* Receiver ID  ECS, GDS */
Receiver_ID=ECS                 /* Operation Mode  "Operation", "Test" */
Mode=Operation;                 /* Data Sequential Number  0~999999999(dec) */
Data_Number=0;                  /* End-data Flag  "E" or "" */
EndData_Flag=E;                 /* User ID */
Send_Date=1998-08-01;           /* Send Date  yyyy-mm-dd */
Send_Time=06:56:12.056;         /* Send Time  hh:mm:ss.msc */
END_OBJECT=GDS_Header;
/* End of GDS Header */
BEGIN_OBJECT=DATA
/*  Data Descriptin Area */
END_OBJECT=DATA
```

No.	Key	Contents	Value
1	Message_Number	Message serial number in seder segment. A series of Interface sequence is set same number.	"000000000" ~"999999999"(dec) Values are used cyclically.
2	ReEntrantCheck	If this flag is "Yes", same " Message_Number" message can be skipped in Receiver.	"Yes": Check "No": No Check
3	Sender_ID	Identifier of Sender's Segment/Subsystem.	ECS, GDS
4	Receiver_ID	Identifier of Receiver's Segment/Subsystem	Same as Sender_ID
5	Mode	Identifier of Operation Mode / Test Mode.	"Operation" or "Test"
6	Data_Number	Serial Number in the case there are plural data.	"000000000" ~"999999999" (dec)
7	EndData_Flag	Identifier of End data in the case there are plural data.	ASCII Blank (20hex): all data except end one "E": Last data (including in the case of there is only 1 data)
8	Send_Date	Date to send message. Display with yyyy-mm-dd. Use **GMT**. yyyy: Year mm: Month dd: Day	yyyy:0000~9999 mm:01~12 dd:01~28,29,30,31
9	Send_Time	Time to send message. Display with hh:mm:ss.msc. Use **GMT**. hh: Hour (24hour system) mm: Minute ss: Second msc: Milli Second	hh:00~23 mm:00~59 ss:00~59 msc:000~999 Use MSCif necessary. Set 000 if not necessary.

Figure 4-9. Standard GDS E-mail Header

4.6.3.9 File Naming Convention

Naming convention of L1 Product File for delivery to EDC is shown in Table 4-4.

Table 4-4. File Naming Convention

Field	Bytes	Content	Value
Creator	2	Characters representing the file creator. Specify PGS(SDPS2) as the data creator.	"pg"
Delimiter	1		"-"
Data Type	2	Characters representing the data type (Product).	"PR"
Product Level	4	Alpha-numerics representing the Product Processing Level.	L1A and L1B
Supplemental Information	2	Alpha-numerics. Usage includes to identify the sensor.	
Delimiter	1		"-"
Sequential Number	18	Sequential number given in the product generation process.	
Production Plan ID	10		9999999999
Delimiter	1		"_"
Production Request ID	3		999
Delimiter	1		"_"
Sequential Number of Product in Production Request	3		999

4.6.3.10 Bar Code Convention

Figure 4-10 and Table 4-5 represent the bar-code format of L1 product media to be shipped to EDC.

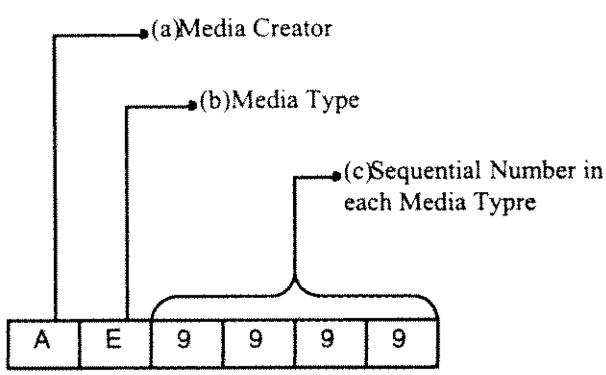

Figure 4-10. Bar Code Format used for Media for delivery to EDC

Table 4-5. Definition of Bar Code Format for Media Delivery to EDC

Field Name	Bytes	Content	Value
(a)Media Creator	1	A character representing Media Creator.	"A"=ASTER
(b)Media Type	1	An alpha-numeric representing Media Type.	"E"=For shipping Reprocessed and resent D3 Cassette tape is different from "E". This value is TBD.
(c)Sequential Number in each Media Type	4	A sequential number in each Media Type (in Hex)	0-`FFFF X' (0-65535 in decimal)

4.7 Data Exchange Between the ECS CSMS and the ASTER GDS AOS

Network communications for ECS bulletin board access will use standard Internet NNTP. Membership to ECS bulletin board groups is coordinated with ECS System Monitoring and Control Center (SMC) operations personnel. Network connectivity for bulletin board communications will be accomplished via the EBnet.

4.8 Data Exchange Between the ECS CSMS and the ASTER GDS CSMS

Network communications for the exchange of management data will use SMTP electronic mail (email) and will be formatted in a machine-parsable form. More detailed information describing the interfaces between the ECS CSMS and the ASTER GDS CSMS GSMS is contained in Section 8 of this ICD.

4.9 Expedited Data From The ECS GSFC DAAC to the ASTER GDS CSMS ADN/DADS

ECS will provide Expedited Data Sets (EDS) to the ASTER GDS for use in evaluating the operation of the instrument. Refer to Section 9 of this document for EDS overview and information related to EDS protocols, formats, authentication, etc.

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5. Interfaces Between the ECS FOS and the ASTER GDS AOS

5.1 Overview

This section describes the interfaces for data and information exchange between ECS FOS and the ASTER GDS AOS, including the transmission of planning and scheduling messages, planning aid files, instrument command information, reports, and coordination messages.

5.2 Planning and Scheduling Message Overview

5.2.1 Planning and Scheduling Data Exchange Protocols

All of the instrument planning and scheduling data flows identified in this section are transmitted between the ASTER ICC's ECS IST and an AOS Instrument Control Operations Subsystem (ICOS) host via the ICC LAN using FTP. The operational timeline associated with the generation and exchange of planning and scheduling messages will be defined in the Operations ICD EOS AM Spacecraft to ASTER.

5.2.2 Planning and Scheduling Message Data Conventions

The data items in the instrument planning and scheduling messages are in standard 8-bit ASCII format, unless stated otherwise. All data fields are fixed length fields. Data within the data fields shall be left-justified; if the data does not fill the entire length of the data field, the remaining bytes shall be filled with ASCII blanks. Unused data fields shall be filled with ASCII blanks.

Date and time fields are expressed in Universal Time Coordinated (UTC), unless stated otherwise.

Planning and Scheduling data files are limited in size to a maximum of 2 GB (the maximum size of a UNIX file). Planning and Scheduling data files will be uniquely identified by the following file naming convention:

ASTER Short Term Schedule (Scheduling Mode = Schedule):	ASTER_STS_yyyydddnnn.txt
ASTER Short Term Schedule (Scheduling Mode = Analysis):	ASTER_STA_yyyydddnnn.txt
ASTER One Day Schedule (Scheduling Mode = Schedule):	ASTER_ODS_yyyydddnnn.txt
ASTER One Day Schedule (Scheduling Mode = Analysis):	ASTER_ODA_yyyydddnnn.txt
Preliminary Resource Schedule (Scheduling Mode = Schedule):	EOC_PRS_yyyydddnnn.txt
Preliminary Resource Schedule (Scheduling Mode = Analysis):	EOC_PRA_yyyydddnnn.txt
Activity Schedule (Scheduling Mode = Schedule):	EOC_ACS_yyyydddnnn.txt

Activity Schedule (Scheduling Mode = Analysis): EOC_ACA_yyyydddnnn.txt

Detailed Activity Schedule: EOC_DAS_yyyydddnnn.txt

Request for EOC Schedules: ASTER_REQ_yyyydddnnn.txt

where:

yyyyddd = the year and the three digit day-of-year of the generation of the message

nnn = a unique number (reset to 001 at the start of each day) assigned by the originator of the message.

Section 5.3 identifies the contents of each of these Planning and Scheduling data files. Sections 5.2.3 and 5.4 describe the format of the records contained within these files.

5.2.3 Planning and Scheduling Data Header

All of the instrument planning and scheduling messages exchanged between the ECS IST and the ASTER AOS will use the standard Planning and Scheduling Data Header shown in Table 5-1.

Table 5-1. Planning and Scheduling Data Header Format (1 of 2)

Field	Description	Type (Length in Bytes)	Values
Message Type	Identifies the type of message being transmitted	ASCII (3 B)	STS: ASTER Short Term Schedule PRS: Preliminary Resource Schedule ODS: ASTER One Day Schedule ACS: Activity Schedule DAS: Detailed Activity Schedule REQ: Request for EOC Schedule Transmission to the ASTER ICC
Message ID	The message ID is formatted as "yyyydddnnn", where "yyyyddd" represents the four digit year and three digit day of year that the message was sent. The "nnn" portion of the ID is an incrementing sequence number identifying the scheduling message that was sent on that day. The incrementing sequence number shall begin with "001". The Message ID and the Message Type uniquely identify the Planning and Scheduling Message that is being sent.	ASCII (10 B)	yyyy: 1995 - 2100 ddd: 001 - 366 nnn: 001 - 999
Source	Identifies the sender of the message	ASCII (3 B)	AST: ASTER Instrument Control Center EOC: EOS Operations Center
Destination	Identifies the intended receiver of the message	ASCII (3 B)	AST: ASTER Instrument Control Center EOC: EOS Operations Center
Spacecraft Name	Identifies the spacecraft name	ASCII (3 B)	AM1: EOS AM-1 Spacecraft

Table 5-1. Planning and Scheduling Data Header Format (2 of 2)

Field	Description	Type (Length in Bytes)	Values
Instrument Name	Identifies the instrument name	ASCII (3 B)	AST: ASTER
Scheduling Mode	Specifies whether the activities identified in the message are to be scheduled on the EOC master schedule (SCHEDULE), or checked for constraints only for "what-if" analysis (ANALYSIS). For Message Type = "REQ" or "DAS", Scheduling Mode will always = "SCHEDULE".	ASCII (8 B)	SCHEDULE: Schedule on master EOC schedule ANALYSIS: Constraint-check only
Number of Days in File	The number of days in file is an integer that identifies the number of days of schedule data contained in this file. Partial days will be rounded up (e.g. 0.4 days will be represented as 1). For Message Type = REQ, this value should be "00".	ASCII (2 B)	00 - 99
Schedule Start Time	The Schedule Start Time represents the earliest activity start time contained in this schedule. The start time will be identified with the following format: yyyydddhhmmss. For Message Type = REQ, this field should contain the start time of the schedule to be transmitted to the ASTER ICC.	ASCII (13 B)	yyyy: 1995 - 2100 ddd: 001 - 366 hh: 00 - 23 mm: 00 - 59 ss: 00 - 59
Schedule Stop Time	The Schedule Stop Time represents the latest activity start time contained in the message contents. The stop time will be identified with the following format: yyyydddhhmmss. For Message Type = REQ, this field should contain the latest activity start time in the schedule to be sent to the ASTER ICC.	ASCII (13 B)	yyyy: 1995 - 2100 ddd: 001 - 366 hh: 00 - 23 mm: 00 - 59 ss: 00 - 59
Number of Scheduling Resources	The number of ASTER scheduling resources affected by this schedule. This field only applies to the STS and the ODS. This field will be set to zero for Request for EOC Schedules, Preliminary Resource Schedule, Activity Schedule, and Detailed Activity Schedule.	ASCII (2B)	00 - 99
Scheduling Resources	This field repeats (occurrences = "Number of Scheduling Resources" [previous field]). These fields contain the ASTER scheduling resource names that are affected by this schedule.	ASCII (40 B)	Valid Resource Names as defined in the EOS AM-1 PDB.
Number of Records in File	The number of records in file is an integer that identifies the number of records contained within this file (including the Planning and Scheduling Data Header).	ASCII (8 B)	00000001 - 99999999
Record Terminator	Identifies the end of the Planning and Scheduling Data Header	ASCII (1 B)	\n (new line character)

5.3 Schedule Messages

Section 5.3 describes the ASTER Short Term Schedule (STS), the ASTER One Day Schedule (ODS), the Preliminary Resource Schedule, Activity Schedule, and Detailed Activity Schedule. The ASTER STSs and ASTER ODSs are sent from the ASTER AOS to the ECS IST. The Preliminary Resource Schedules, Activity Schedules, and Detailed Activity Schedules are sent from the ECS IST to the AOS. The Preliminary Resource Schedule is generated and sent in response to the ASTER STS. The Activity Schedule is generated and sent in response to the ASTER ODS. The Detailed Activity Schedule is the conflict-free schedule that is used within the EOC to generate the integrated command load and the ground script.

Schedule Data Record formats for Activity Records, Parameter Records, DAR ID Records, Mode Records, Constraint Records, and Comment Records are described in Section 5.4.

5.3.1 ASTER Short Term Schedule (STS)

5.3.1.1 General

The ASTER STS is sent from the ASTER AOS to the ECS IST via the ICC LAN. The purpose of the STS is to provide initial activities, with specific timing, to the EOC for use in planning of AM-1 spacecraft resources and Tracking and Data Relay Satellite System (TDRSS) contact times. The STS identifies the resources required by the ASTER instrument during the period of time covered by the STS.

The Planning and Scheduling Data Header contains fields that indicate the number of scheduling resources and scheduling resource names that are affected by this STS. For STSs where the "Scheduling Mode" field is set to "SCHEDULE", the activities specified in the STS replace those activities on the affected resources on the EOC master schedule where the activity start times are between the "Start Time" and "Stop Time" fields in the Planning and Scheduling Data Header. Note that a STS that contains no activity records will result in the deletion of all ASTER activities on the affected resources whose Start Times fall within the inclusive window identified by the Schedule Start Time and Schedule Stop Time fields in the Planning and Scheduling Data Header. When the "Scheduling Mode" field is set to "ANALYSIS", the activities are checked for constraints only (i.e., the EOC master schedule is not modified) and the analysis results data format is the same as the SCHEDULE data format (with Scheduling Mode = ANALYSIS).

5.3.1.2 Detailed Data Description

The STS is described in Table 5-2. The Planning and Scheduling Data Header is the first record of the STS. The Planning and Scheduling Data Header specifies the Scheduling Mode of the STS as well as the Start Time and Stop Time of the activities that are included in the STS.

Table 5-2. Short Term Schedule Format

Field	Description	Type (Length in Bytes)	Values
Planning and Scheduling Data Header	Identifies the type of message being transmitted, the scheduling mode, and the time frame covered by the STS	ASCII (variable)	See Table 5-1
Activity Records, Parameter Records, DAR ID Records, Comment Records.	Short Term Schedule Data.	ASCII (variable)	See Tables 5-8 through 5-10 and 5-14

The Planning and Scheduling Data Header is followed by a list of Activity Records, Parameter Records, DAR ID Records, and Comment Records. Activity Records are in ascending start time order. The STS contains Activity Records for valid Data Base Defined Activities only. (Refer Section 5.4.1 for more information about Activity Records). If an Activity Record specifies that the number of parameters is greater than zero, then the Activity Record is immediately followed by one or more Parameter Records identifying all of the necessary parameters. If an Activity Record specifies that the number of DAR IDs is greater than zero, then the Activity Record is followed by one or more DAR ID records identifying all of the relevant DAR IDs. If an Activity Record specifies both parameters and DAR IDs, the Parameter Record(s) appear first, followed by the DAR ID record(s).

Comment Records may be inserted anywhere in the STS after the Planning and Scheduling Data Header, except between an Activity Record and its associated Parameter Record(s) or DAR ID Record(s).

A sample of the ASTER STS file layout is shown in Figure 5-1.

5.3.2 ASTER One Day Schedule (ODS)

5.3.2.1 General

The ASTER ODS is sent from the ASTER AOS to the ECS IST via the ICC LAN. The purpose of the ODS is to provide the EOC with the schedule of planned ASTER activities (including scheduled times and resource needs) for a target day.

The Planning and Scheduling Data Header contains fields that indicate the number of scheduling resources and scheduling resource names that are affected by this ODS. For ODSs where the "Scheduling Mode" field is set to "SCHEDULE", the activities specified in the ODS replace those activities on the affected resources on the EOC master schedule where the activity start times are between the "Start Time" and "Stop Time" fields in the ODS Planning and Scheduling Data Header. Note that a ODS that contains no activity records will result in the deletion of all ASTER activities on the affected resources whose Start Time falls within the inclusive window identified by the Schedule Start Time and Schedule Stop Time fields in the Planning and Scheduling Data Header. When the "Scheduling Mode" field is set to "ANALYSIS", the activities are checked for constraints only (i.e., the EOC master schedule is not modified) and the analysis results data format is the same as the SCHEDULE data format (with Scheduling Mode = ANALYSIS).

Note: "Late change" ODSs received after the FOT has locked the Detailed Activity Schedule are automatically processed as "ANALYSIS". The FOT may apply the "Late Change" ODS to the EOC master schedule after verification that the ODS will result in a conflict-free Detailed Activity Schedule. If the late change ODS is applied to the Master Schedule, the ASTER AOS will be notified by automated ftp of the new detailed schedule. If the late change ODS is not applied to the Master Schedule the FOT will notify the AOS either verbally or via e-mail.

5.3.2.2 Detailed Data Description

The ODS is described in Table 5-3. The Planning and Scheduling Data Header is the first record of the ODS. The Planning and Scheduling Data Header specifies the Scheduling Mode of the ODS as well as the Start Time and Stop Time of the activities included in the ODS.

```
STS1999003001ASTEOCAM1ASTSCHEDULE48199902400000019990722359590 1ASTER                                  00000009
#This example shows the layout of sample records within an ASTER Short Term Schedule
#The following record is a sample Data Base Defined Activity Record scheduled by absolute time.
ACTABSASTER                                   TIR_ACTIVITY_A                          1234567
                                               1999024013015
1999024013115              0000
#The following records are an example of a Data Base Defined Activity scheduled by orbital event (EVT),
#including DAR ID records.
ACTEVTASTER                                   VNIR1_ACTIVITY_Z                        1234570
Node_Ascending                0001222201-0200            Node_Ascending                    0001222201+0700
                           0006
DARASTER_DAR_ID_22334455,ASTER_DAR_ID66497358,ASTER_DAR_ID_94329764,ASTER_DAR_ID_56977777,ASTER_DAR_ID_65034674,
DARASTER_DAR_ID_00000001
#The following records are another example of a data base defined activity scheduled by orbital event (EVT),
#including Activity, Parameter Records and a DAR ID record.
ACTEVTASTER                                   SWIR_ACTIVITY_XYZ                       1234571
Node_Descending  0001222201-0200                         Node_Descending                   0001222201+0700
                           0401
PRMCMD_MNEMONIC_1[1]PARAMETER_NAME_1=PARAMETER_VALUE,CMD_MNEMONIC_1[1]/PARAMETER_NAME_2=PARAMETER_VALUE,
PRMCMD_MNEMONIC_1[1]PARAMETER_NAME_3=PARAMETER_VALUE,CMD_MNEMONIC_2[2]/PARAMETER_NAME_1=PARAMETER_VALUE
DARASTER_DAR_ID_000008001
#
#
#Without the comment records, the STS records in the above examples would appear as:
STS1999003001ASTEOCAM1ASTSCHEDULE48199902400000019990722359590 1ASTER                                  00000009
ACTABSASTER                                   TIR_ACTIVITY_A                          1234567
                                               1999024013015
1999024013115              0000
ACTEVTASTER                                   VNIR1_ACTIVITY_Z                        1234570
Node_Ascending                0001222201-0200            Node_Ascending                    0001222201+0700
                           0006
DARASTER_DAR_ID_22334455,ASTER_DAR_ID66497358,ASTER_DAR_ID_94329764,ASTER_DAR_ID_56977777,ASTER_DAR_ID_65034674,
DARASTER_DAR_ID_00000001
ACTEVTASTER                                   SWIR_ACTIVITY_XYZ                       1234571
Node_Descending  0001222201-0200                         Node_Descending                   0001222201+0700
                           0401
PRMCMD_MNEMONIC_1[1]PARAMETER_NAME_1=PARAMETER_VALUE,CMD_MNEMONIC_1[1]/PARAMETER_NAME_2=PARAMETER_VALUE,
PRMCMD_MNEMONIC_1[1]PARAMETER_NAME_3=PARAMETER_VALUE,CMD_MNEMONIC_2[2]/PARAMETER_NAME_1=PARAMETER_VALUE
DARASTER_DAR_ID_000008001
```

Figure 5-1. Sample Short Term Schedule File Layout

Table 5-3. *One Day Schedule Format*

Field	Description	Type (Length in Bytes)	Values
Planning and Scheduling Data Header	Identifies the type of message being transmitted, the scheduling mode, and the time frame covered by the ODS	ASCII (variable)	See Table 5-1
Activity Records, Parameter Records, DAR ID Records, Comment Records.	One Day Schedule Data.	ASCII (variable)	See Tables 5-8 through 5-10 and 5-14

The Planning and Scheduling Data Header is followed by a list of Activity Records, Parameter Records, DAR ID Records, and Comment Records. Activity Records are in ascending start time order. The ODS contains Activity Records for valid Data Base Defined Activities only. If an Activity Record specifies that the number of parameters is greater than zero, then the Activity Record is immediately followed by one or more Parameter Records identifying all of the necessary parameters. If an Activity specifies that the number of DAR IDs is greater than zero, then the Activity Record is followed by one or more DAR ID records identifying all of the relevant DAR IDs. If an Activity Record specifies both parameters and DAR IDs, the Parameter Record(s) appear first, followed by the DAR ID record(s).

Comment Records may be inserted anywhere in the ODS after the Planning and Scheduling Data Header, except between an Activity Record and its associated Parameter Record(s) or DAR ID Record(s).

5.3.3 Preliminary Resource Schedule

5.3.3.1 General

The Preliminary Resource Schedule is automatically sent from the ECS IST to the ASTER AOS via automated FTP over the ICC LAN. The purpose of the Preliminary Resource Schedule is to provide all scheduled spacecraft and instrument activities, including TDRSS contact activities, to the ASTER AOS for the target week. The Preliminary Resource Schedule is generated in response to the ASTER STS.

5.3.3.2 Detailed Data Description

The Preliminary Resource Schedule is described in Table 5-4. The Planning and Scheduling Data Header is the first record of the Preliminary Resource Schedule. The Planning and Scheduling Data Header specifies the Scheduling Mode of the Preliminary Resource Schedule as well as the Start Time and Stop Time of the activities included in the Preliminary Resource Schedule. A Preliminary Resource Schedule with Scheduling Mode = SCHEDULE is sent in response to a STS with Scheduling Mode = SCHEDULE. A Preliminary Resource Schedule with Scheduling Mode = ANALYSIS is sent in response to a STS with Scheduling Mode = ANALYSIS.

Table 5-4. Preliminary Resource Schedule Format

Field	Description	Type (Length in Bytes)	Values
Planning and Scheduling Data Header	Identifies the type of message being transmitted, the scheduling mode, and the time frame covered by the Preliminary Resource Schedule.	ASCII (variable)	See Table 5-1
Activity Records, Parameter Records, DAR ID Records, Mode Records, and Constraint Records.	Preliminary Resource Schedule Data.	ASCII (variable)	See Tables 5-8 through 5-12 and 5-14

The Planning and Scheduling Data Header is followed by a list of Activity Records, Parameter Records, DAR ID Records, Mode Records, then Constraint Records.

Activity Records are in ascending start time order. The Activity Records (with their associated Parameter Records and DAR ID Records) appear first, followed by Mode Records, then Constraint Records. If an Activity Record specifies that the number of parameters is greater than zero, then the Activity Record is immediately followed by one or more Parameter Records identifying all of the necessary parameters. If an Activity Record specifies that the number of DAR IDs is greater than zero, then the Activity Record is followed by one or more DAR ID records identifying all of the relevant DAR IDs. If an Activity Record specifies both parameters and DAR IDs, the Parameter Record(s) appear first, followed by the DAR ID record(s).

Mode Records appear in ascending instrument mode time order. The mode characterizes an instrument or subsystem's operational state. Mode Records are generated by the FOS as a result of scheduling activities into the mission plan.

Mode Records are followed by a listing of Constraint Records. Constraint Records appear in ascending constraint start time order. Constraint Records appear as needed to identify constraint violations between activities. Constraints are identified as either "hard" or "soft" constraints. Hard constraints must be resolved prior to generation of the Detailed Activity Schedule. For soft constraints, the necessary coordination for constraints resolutions will be performed between the AOS and the EOC. The process for this coordination will be covered in the Operations ICD EOS AM Spacecraft to ASTER.

A sample of the Preliminary Resource Schedule file layout is shown in Figure 5-2.

5.3.4 Activity Schedule

5.3.4.1 General

The Activity Schedule is automatically sent from the ECS IST to the ASTER AOS via automated FTP over the ICC LAN. The purpose of the Activity Schedule is to provide the ASTER AOS with the EOC schedule of activities, including TDRSS contact activities, after receipt and processing of the ASTER ODS.

```
PRS1999003034EOCASTAM1ASTSCHEDULE4819990240000001999072235959000000 1342
ACTEVTCERES                                CERES-ACTIVITY-12354                                87656787
S/C_Night/Day                  0001117401+00001999024000000S/C_Day/Night                     0001117401+0130
1999024004745               0000
ACTABSMODIS                                MODIS_ACTIVITY_676                                  81234589
                         1999024000015
1999024000115               0000
ACTABSASTER                                TIR_ACTIVITY_A                                123456778654389
                         1999024013015
19990240131150001 0.00100.00000000
ACTEVTASTER                                VNIR1_ACTIVITY_Z                              123457078655400
Node_Ascending                 0001222201-02001999030024530Node_Ascending                    0001222201+0700
1999030025430000 07.50050.00000006
DARASTER_DAR_ID_22334455,ASTER_DAR_ID66497358,ASTER_DAR_ID_94329764,ASTER_DAR_ID_56977777,ASTER_DAR_ID_65034674,
DARASTER_DAR_ID_00000001
ACTABSAM1                                  TDRSS-CONTACT                                       46474888
                         1999030024645
1999030025645               0000
ACTEVTASTER                                SWIR_ACTIVITY_XYZ                             123457078685400
Node_Descending                0001222201-02001999030014500Node_Descending                   0001222201+0700
1999030014700               0401
PRMCMD_MNEMONIC_1[1]PARAMETER_NAME_1=PARAMETER_VALUE,CMD_MNEMONIC_1[1]/PARAMETER_NAME_2=PARAMETER_VALUE,
PRMCMD_MNEMONIC_1[1]PARAMETER_NAME_3=PARAMETER_VALUE,CMD_MNEMONIC_2[2]/PARAMETER_NAME_1=PARAMETER_VALUE
DARASTER_DAR_ID_000008001
MODCERES                                 STDBY                         19990241640001999024165900 00015.00
000.0000
MODCERES                                 SOLARCAL                      19990241659001999024230000 00015.00
000.0000
MODCERES                                 BIAXIAL                       1999024230000                 00045.00
000.0009
CONMODIS                                 MOD_ACTIVITY_X                         86344617
MOPITT                                 MOP_ACTIVITY_XYZ                     99876567199902601 3025
1999026013030026S
```

Figure 5-2. Sample Preliminary Resource Schedule File Layout

5.3.4.2 Detailed Data Description

The Activity Schedule is described in Table 5-5. The Planning and Scheduling Data Header is the first record of the Activity Schedule. The Planning and Scheduling Data Header specifies the Scheduling Mode of the Activity Schedule as well as the Start Time and Stop Time of the activities included in the Activity Schedule. An Activity Schedule with Scheduling Mode = SCHEDULE is sent in response to a ODS with Scheduling Mode = SCHEDULE. An Activity Schedule with Scheduling Mode = ANALYSIS is sent in response to a ODS with Scheduling Mode = ANALYSIS.

The Planning and Scheduling Data Header is followed by a list of Activity Records, Parameter Records, DAR ID Records, Mode Records, and Constraint Records. The Activity Records (with their associated Parameter Records and DAR ID Records) appear first, followed by Mode Records, then Constraint Records.

Activity Records appear in ascending start time order. If an Activity Record specifies that the number of parameters is greater than zero, then the Activity Record is immediately followed by one or more Parameter Records identifying all of the necessary parameters. If an Activity Record specifies that the number of DAR IDs is greater than zero, then the Activity Record is followed by one or more DAR ID records identifying all of the relevant DAR IDs. If an Activity Record specifies both parameters and DAR IDs, the Parameter Record(s) appear first, followed by the DAR ID record(s).

Mode Records appear in ascending instrument mode time order. The mode characterizes an instrument or subsystem's operational state. Mode Records are generated by the FOS as a result of scheduling activities into the mission plan.

Mode Records are followed by a listing of Constraint Records. Constraint Records appear in ascending constraint start time order. Constraint Records appear as needed to identify constraint violations between activities. Constraints are identified as either "hard" or "soft" constraints. Hard constraints must be resolved prior to generation of the Detailed Activity Schedule.

Table 5-5. Activity Schedule Format

Field	Description	Type (Length in Bytes)	Values
Planning and Scheduling Data Header	Identifies the type of message being transmitted, the scheduling mode, and the time frame covered by the Activity Schedule.	ASCII (variable)	See Table 5-1
Activity Records, Parameter Records, DAR ID Records, Mode Records, and Constraint Records.	Activity Schedule Data.	ASCII (variable)	See Tables 5-8 through 5-12 and 5-14

5.3.5 Detailed Activity Schedule

5.3.5.1 General

The Detailed Activity Schedule is automatically sent from the ECS IST to the ASTER AOS via automated FTP over the ICC LAN. The purpose of the Detailed Activity Schedule is to provide the ASTER AOS with the conflict-free schedule that is used by the EOC to generate the AM-1 Spacecraft Control Computer (SCC) stored command loads and ground script. The Detailed Activity Schedule for a target day becomes available at the ECS IST when the Detailed Activity Schedule is generated for the EOC to prepare the operations day products (ground script and command loads). The Detailed Activity Schedule contains activities for all AM1 subsystems and instruments, including TDRSS contact activities.

5.3.5.2 Detailed Data Description

The Detailed Activity Schedule is described in Table 5-6. The Planning and Scheduling Data Header is the first record of the Detailed Activity Schedule. The Scheduling Mode of the Detailed Activity Schedule, as defined in the Planning and Scheduling Data Header is always set to "SCHEDULE". The Planning and Scheduling Data Header also identifies the Start Time and Stop Time of the activities included in the Detailed Activity Schedule.

The Planning and Scheduling Data Header is followed by a list of Activity Records, Parameter Records, DAR ID Records, Mode Records, and Constraint Records. The Activity Records (with their associated Parameter Records and DAR ID Records) appear first, followed by Mode Records, then Constraint Records.

Activity Records appear in ascending start time order. If an Activity Record specifies that the number of parameters is greater than zero, then the Activity Record is immediately followed by one or more Parameter Records identifying all of the necessary parameters. If an Activity Record specifies that the number of DAR IDs is greater than zero, then the Activity Record is followed by one or more DAR ID records identifying all of the relevant DAR IDs. If an Activity Record specifies both parameters and DAR IDs, the Parameter Record(s) appear first, followed by the DAR ID record(s).

Table 5-6. Detailed Activity Schedule Format

Field	Description	Type (Length in Bytes)	Values
Planning and Scheduling Data Header	Identifies the type of message being transmitted, the scheduling mode, and the time frame covered by the Detailed Activity Schedule. For Detailed Activity Schedule messages, the scheduling mode field is always = "SCHEDULE".	ASCII (variable)	See Table 5-1
Activity Records, Parameter Records, DAR ID Records, Mode Records, and Constraint Records.	Detailed Activity Schedule Data.	ASCII (variable)	See Tables 5-8 through 5-12 and 5-14

Mode Records appear in ascending instrument mode time order. The mode characterizes an instrument or subsystem's operational state. Mode Records are generated by the FOS as a result of scheduling activities into the mission plan.

Mode Records are followed by a listing of Constraint Records. Constraint Records appear in ascending constraint start time order. Constraint Records appear as needed to identify soft constraint violations between activities. Activities with hard constraint violations must be resolved prior to generation of the Detailed Activity Schedule, therefore hard constraint violations will not appear in the Detailed Activity Schedule Constraint Records.

5.4 Schedule Data Record Formats

5.4.1 Activity Records

The EOC performs scheduling of spacecraft and instrument operations through the use of data constructs called activities. Planning and Scheduling inputs (e.g., the ASTER STS and ODS) and the resulting EOC schedules (e.g., Preliminary Resource Schedule, Activity Schedule, and Detailed Activity Schedule) include lists of Activity Records which describe planned and scheduled spacecraft and instrument operations.

Data Base Defined Activities are applicable for any of the AM-1 instruments or subsystems. Data Base Defined Activities reference pre-defined, pre-validated, configuration-controlled activities which are stored in the EOC and ASTER ICC Data Bases. A Data Base Defined Activity which does not have any commands associated with it is called a Label Activity. Label Activities may be used to annotate events.

Data Base Defined Activities, may be scheduled with respect to Absolute Time or Orbit Events. Table 5-7 provides the list of valid scheduling Orbit Events. The desired scheduling method for each activity is identified by the "Scheduling Type" field (ABS or EVT) of the Activity Record. The Activity Record is described in Table 5-8. Refer to Figures 5-1 and 5-2 for examples of Activity Records.

5.4.2 Parameter Records

If an Activity Record specifies that the number of parameters is greater than zero, then the Activity Record is immediately followed by one or more Parameter Records identifying all of the necessary parameters. If all of the required parameter specifications do not fit within a single Parameter Record, additional Parameter Records are used. The number of Parameter specifications must equal the Number of Parameters field from the Activity Record. A Parameter specification (mnemonic/parameter name = value) cannot be split across different Parameter Records. If a given mnemonic/parameter name occurs multiple times in the Activity definition, then a Parameter specification must include the command occurrence number of the command mnemonic whose parameter is being specified. Command occurrence numbers are assigned sequentially within an activity definition beginning with 1. The Parameter Record is described in Table 5-9. Refer to Figures 5-1 and 5-2 for examples of Parameter Records.

Table 5-7. Orbit Event Mnemonics

Event Mnemonic	Event	Definition
(refer to ECS/FDD ICD)	Spacecraft sunrise	The time that the spacecraft passes into daylight
(refer to ECS/FDD ICD)	Spacecraft sunset	The time that the spacecraft passes into night
(refer to ECS/FDD ICD)	Night/Day boundary of earth nadir crossing	The time that the spacecraft nadir track crosses the day/night terminator (from night to day) on the earth's surface
(refer to ECS/FDD ICD)	Day/Night boundary of earth nadir crossing	The time that the spacecraft nadir track crosses the day/night terminator (from day to night) on the earth's surface
(refer to ECS/FDD ICD)	Ascending node crossing time	The time that the spacecraft crosses the equator while traveling from South to North
(refer to ECS/FDD ICD)	Descending node crossing time	The time that the spacecraft crosses the equator while traveling from North to South
(refer to ECS/FDD ICD)	Eclipse Entry time	The time that the spacecraft nadir passes into a shadow region defined on the earth's surface
(refer to ECS/FDD ICD)	Eclipse Exit time	The time that the spacecraft nadir passes out of a shadow region defined on the earth's surface
(refer to ECS/FDD ICD)	South Atlantic Anomaly (SAA) Entry time	The time that the spacecraft enters the South Atlantic Anomaly region
(refer to ECS/FDD ICD)	SAA Exit time	The time that the spacecraft exits the South Atlantic Anomaly region
Apogee	Apogee time	The time that the spacecraft reaches the farthest point from Earth in the orbit
Perigee	Perigee time	The time that the spacecraft reaches the closest point to Earth in the orbit
(refer to ECS/FDD ICD)	Spacecraft noon	The time of spacecraft noon.
(refer to ECS/FDD ICD)	Spacecraft minimum latitude	The time that the spacecraft crosses the minimum latitude point.
(refer to ECS/FDD ICD)	Spacecraft maximum latitude	The time that the spacecraft crosses the maximum latitude point.
(refer to ECS/FDD ICD)	Van Allen Belt Entry time	The time that the spacecraft enters the Van Allen Belt region.
(refer to ECS/FDD ICD)	Van Allen Belt Exit time	The time that the spacecraft exits the Van Allen Belt region.

Table 5-8. Activity Record Format (1 of 4)

Field	Description	Type (Length in Bytes)	Values
Record Type	Indicates that this is an Activity Record	ASCII (3B)	ACT
Scheduling Type	Indicates the type of scheduling used for the activity (i.e., absolute time or event-based)	ASCII (3 B)	ABS: scheduled based on absolute time EVT: scheduled as an offset from a scheduling event
Activity Resource Name	Identifies the scheduling resource upon which the activity is scheduled. Valid resource names are defined in the EOS AM-1 Project Data Base (PDB). The STS and ODS will only contain activities for ASTER scheduling resources.	ASCII (40 B)	Valid Activity Resource Name as defined in the EOS AM-1 Project Data Base.
Activity Name	Identifies the activity definition name in the EOC data base	ASCII (40 B)	A valid activity name defined in the EOC data base.
ASTER Activity ID	An integer value that uniquely identifies this activity. The ID is formatted as "nnnnnnn", where "nnnnnnn" is a unique number assigned to this activity by the ASTER ICC.	ASCII (7 B)	nnnnnnn: 0000000 - 9999999

Table 5-8. Activity Record Format (2 of 4)

Field	Description	Type (Length in Bytes)	Values
EOC Activity ID	An integer value that uniquely identifies this activity. The ID is formatted as "nnnnnnnn", where "nnnnnnnn" is a unique number assigned to this activity by the EOC when the activity is scheduled. The EOC Activity ID is used for coordination between the STS-Preliminary Resource Schedule and ODS-Activity Schedule. For STS and ODS, this field is filled with ASCII blanks.	ASCII (8 B)	nnnnnnnn: 00000000 - 99999999
Start Event	The Start Event identifies the scheduling event on which the reference activity "START" point (as defined in the activity definition in the data base) is based. Note: The reference activity "START" is not necessarily equal to the execution time of the first command in the activity. The Start Event is specified as EVENT ORBIT SEQNO, where EVENT represents a mnemonic for a valid scheduling event (fixed length 32 characters); ORBIT represents the orbit number (fixed length 8 digits, as defined in FDF planning aids); and SEQNO represents the sequential number of the event in the specified orbit (fixed length 2 digits). For those events that occur only once in an orbit, the SEQNO is always "01". This field is filled with ASCII blanks when Scheduling Type = ABS.	ASCII (42 B)	EVENT: (see Table 5-7) ORBIT: 00000000 - 99999999 SEQNO: 01 - 99
Start Event Delta	The Start Event Delta is represented by a sign (+ or -) and "mmss" to indicate the time (minutes and seconds) offset from the Start Event on which the activity is scheduled. This field is filled with ASCII blanks when Scheduling Type = ABS. A zero delta is represented as "+0000".	ASCII (5 B)	sign: + or - mm: 00 - 99 ss: 00 - 59
Activity Start Time	The Activity Start Time specifies the reference activity "START" point (as defined in the activity definition in the data base) for this activity. Note: The reference activity "START" is not necessarily equal to the execution time of the first command in the activity. The ASTER ICC may insert either blanks or a computed reference activity "START" Time for activities which are scheduled based on events. For activities which are scheduled based on events, EOC will overwrite this field with the most accurate computed reference activity "START" Time based on the latest FDF predicts. The start time will be in the following format: yyyydddhhmmss.	ASCII (13 B)	yyyy: 1995 - 2100 ddd: 001 - 366 hh: 00 - 23 mm: 00 - 59 ss: 00 - 59

Table 5-8. Activity Record Format (3 of 4)

Field	Description	Type (Length in Bytes)	Values
Stop Event	The Stop Event identifies the scheduling event on which the reference activity "STOP" point (as defined in the activity definition in the data base) is based. Note: The reference activity "STOP" is not necessarily equal to the execution time of the last command in the activity. The Stop Event is specified in the same format as the Start Event. This field is filled with ASCII blanks when Scheduling Type = ABS. This field is filled with ASCII blanks when the data base definition for this activity does not have a reference "STOP" point.	ASCII (42 B)	EVENT: (see Table 5-7) ORBIT: 00000000 - 99999999 SEQNO: 01 - 99
Stop Event Delta	The Stop Event Delta is represented by a sign (+ or -) and "mmss" to indicate the time (minutes and seconds) offset from the Stop Event on which the activity stop time is scheduled. This field is filled with ASCII blanks when Scheduling Type = ABS. A zero delta is represented as "+0000".	ASCII (5 B)	sign: + or - mm: 00 - 99 ss: 00 - 59
Activity Stop Time	The Activity Stop Time specifies the reference activity "STOP" point (as defined in the activity definition in the data base) for this activity. Note: The reference activity "STOP" is not necessarily equal to the execution time of the last command in the activity. The ASTER ICC may insert either blanks or a computed reference activity "STOP" Time for activities which are scheduled based on events. For activities scheduled based on events, EOC will overwrite this field with the most accurate computed reference activity "STOP" Time based on the latest FDF predicts. The stop time will be in the following format: yyyydddhhmmss.	ASCII (13 B)	yyyy: 1995 - 2100 ddd: 001 - 366 hh: 00 - 23 mm: 00 - 59 ss: 00 - 59
Start Pointing Angle (Data Base Defined Activities for Slewing)	For Data Base Defined Activities for Slewing, the start pointing angle is expressed as a sign (+ or -) and degrees. The pointing angle is expressed as the cross-track angular value, where +0000.00 represents nadir pointing. For non-slewing data base defined activities, the STS and ODS contain ASCII blanks for this field.	ASCII (8 B)	-0180.00 - +0180.00 (Start Pointing Angle, as defined by the slew angle with reference to the AM-1 spacecraft Y-axis, as defined in the spacecraft coordinate system.)
Stop Pointing Angle (Data Base Defined Activities for Slewing)	For Data Base Defined Activities for Slewing, the stop pointing angle is expressed as a sign (+ or -) and degrees. The pointing angle is expressed as the cross-track angular value, where +0000.00 represents nadir pointing. For non-slewing data base defined activities, the STS and ODS contain ASCII blanks for this field.	ASCII (8 B)	-0180.00 - +0180.00 (Stop Pointing Angle, as defined by the slew angle with reference to the AM-1 spacecraft Y-axis, as defined in the spacecraft coordinate system.)

Table 5-8. Activity Record Format (4 of 4)

Field	Description	Type (Length in Bytes)	Values
Number of Parameters	Identifies the number of user-specified parameters associated with this activity. If there are no user-specified parameters associated with this activity, the value must be "00".	ASCII (2 B)	00 - 99
Number of DAR IDs	Specifies the number of DARs associated with this activity. If there are no DARs associated with this activity, the value must be "00".	ASCII (2 B)	00 - 99
Record Terminator	Identifies the end of this Activity Record	ASCII (1 B)	\n (new line character)

Table 5-9. Parameter Record Format

Field	Description	Type (Length in Bytes)	Values
Record Type	Indicates that this is a Parameter Record.	ASCII (3 B)	PRM
Parameter List	Listing of Parameters (separated by commas) associated with the previous activity record. Each parameter specification is expressed as: command mnemonic [CMD#][1] /parameter name = value..	ASCII (<= 154 B)	Parameter Specifications in the format: "Command Mnemonic [CMD #] /Parameter Name = Value", where Command Mnemonic is a valid activity command mnemonic in the EOC data base and Parameter Name is a valid parameter name in the EOC data base for the referenced command mnemonic. Valid Command Mnemonics and Parameter Names (Command Subfields) are defined in the EOS AM-1 Project Data Base.
Record Terminator	Identifies the end of the Parameter Record	ASCII (1 B)	\n (new line character)

[1]The command occurrence number is required for a command whose parameter is being modified, because the referenced command mnemonic may appear more than once within an activity definition. Commands are numbered sequentially in an activity definition, beginning with 1. The command occurrence number reference will be entered as [5], for example, to specify the fifth command mnemonic in the activity definition.

5.4.3 DAR ID Records

If an Activity Record specifies that the number of DAR IDs is greater than zero, then the Activity Record is followed by one or more DAR ID records identifying all of the relevant DAR IDs. If an Activity Record specifies both parameters and DAR IDs, the Parameter Record(s) appear first, followed by the DAR ID record(s). If all of the required DAR IDs do not fit within a single DAR ID Record, additional DAR ID Records are used. DAR IDs are not split across different DAR ID Records. The DAR ID Record is described in Table 5-10. Refer to Figures 5-1 and 5-2 for examples of DAR ID Records.

Table 5-10. DAR ID Record

Field	Description	Type (Length in Bytes)	Values
Record Type	Indicates that this is a DAR ID Record.	ASCII (3 B)	DAR
DAR ID List	Listing of DAR IDs associated with the previous activity record. DAR IDs are separated by commas.	ASCII (<=154 B)	As determined by ASTER GDS
Record Terminator	Identifies the end of the DAR ID Record	ASCII (1 B)	\n (new line character)

5.4.4 Mode Records

Mode records give operational states of instruments and spacecraft subsystems. Commanding within activities which are scheduled into the mission plan cause instruments and subsystems to transition into various modes. Usually modes are associated with power and data rate information which can be found in the activity definition data base. Mode records will contain a mode name, instrument or subsystem associated with the mode change, power, data rate and the start and stop time of the mode. The Mode Record format is described in Table 5-11. Refer to 5-2 for examples of Mode Records.

5.4.5 Constraint Records

Constraint information is included in Preliminary Resource Schedules, Activity Schedules, and Detailed Activity Schedules. The purpose of the constraint information is to provide detailed information pertaining to scheduling constraint violations and error conditions. The constraint information includes constraint violations for all instruments and spacecraft subsystem activities. If the activity is constrained by more than one activity, a separate Constraint Record is provided for each violation. The Constraint Record is described in Table 5-12. Refer to Figure 5-2 for examples of Constraint Records.

5.4.6 Comment Records

Comment records are optional and may be included in STS or ODS. Comment records are not contained in the Preliminary Resource Schedule, Activity Schedule, or Detailed Activity Schedule. Comment Records are used for annotation only; these records are not processed by the EOC scheduling software. The Comment Record is described in Table 5-14. Refer to Figure 5-1 for examples of Comment Records.

5.5 Request for EOC Schedules

5.5.1 General

The Request for EOC Schedules is sent from the ASTER AOS to the ECS IST. The purpose of the Request for EOC Schedules is to request the ECS IST to obtain a report of a particular portion of the integrated EOC master schedule. This integrated schedule will be an Activity Schedule containing activity schedule data for all EOS AM-1 subsystems and instruments for the time frame specified in the Planning and Scheduling Data Header.

Table 5-11. Mode Record Format

Field	Description	Type (Length in Bytes)	Values
Record Type	Indicates that this is a Mode Record	ASCII (3 B)	MOD: indicates a Mode Record
Mode Resource Name	Identifies the scheduling resource with which the mode is associated. Valid instrument/ subsystem names are defined in the EOS AM-1 Project Data Base.	ASCII (40 B)	Valid Mode Resource Name as defined in the EOS AM-1 Project Data Base.
Mode name	New Mode name as defined in the EOS AM-1 Project Data Base.	ASCII (30B)	A valid new mode name defined in the PDB.
Mode Start Time	The Mode Start Time specifies the Start Time of this mode. The start time will be in the following format: yyyydddhhmmss.	ASCII (13 B)	yyyy: 1995 - 2100 ddd: 001 - 366 hh: 00 - 23 mm: 00 - 59 ss: 00 - 59
Mode Stop Time	The Mode Stop Time specifies the Stop Time of this mode. The stop time will be in the following format: yyyydddhhmmss. For contiguous mode records, the stop time of the previous record will be the same as the start time of the next record. If this is the last record in the list, the stop time field will be blank, indicating that the instrument or subsystem remains in the most recently scheduled mode.	ASCII (13 B)	yyyy: 1995 - 2100 ddd: 001 - 366 hh: 00 - 23 mm: 00 - 59 ss: 00 - 59
Average Power	The average power specifies the average number of watts consumed during the mode.	ASCII (8 B)	00000.00 - 99999.99 (Power)
Data Rate	The data rate specifies the average rate at which data is being stored in the buffer during the mode. The data rate is specified in units of MBits/second.	ASCII (8 B)	000.0000 - 999.9999 (Data Rate)
Record Terminator	Identifies the end of this Mode Record	ASCII (1 B)	\n (new line character)

Table 5-12. Constraint Record (1 of 2)

Field	Description	Type (Length in Bytes)	Values
Record Type	Indicates that this is a Constraint Record	ASCII (3 B)	CON: indicates a Constraint Record
Resource Name	Identifies the scheduling resource upon which the constraint is detected. Valid resource names are defined in the EOS AM-1 Project Data Base.	ASCII (40 B)	Valid Resource Name as defined in the AM-1 Project Data Base.
Activity Name	Identifies the activity name of the activity involved in the constraint violation.	ASCII (40 B)	A valid activity name defined in the PDB. For constraints related to consumables (power, data volume), this field is filled with blanks.
EOC Activity ID	An integer value that uniquely identifies the activity that is under constraint. The ID is formatted as "nnnnnnnn", where "nnnnnnnn" is a unique number assigned to this activity by the EOC when the activity is scheduled. Note: In those cases where an ASTER Activity is not scheduled (Constraint Flag = E), this field will contain the ASTER Activity ID from the STS or ODS.	ASCII (8 B)	nnnnnnnn: 00000000 - 99999999 For constraints related to consumables (power, data volume), this field is filled with blanks.
Constraining Resource Name	Identifies the scheduling resource with which the activity is constrained. Valid resource names are defined in the EOS AM-1 Project Data Base.	ASCII (40 B)	Valid Activity or Mode Resource Name as defined in the EOS AM-1 Project Data Base. For constraints related to consumables (power, data volume), this field is filled with blanks.
Constraining Activity Name	Identifies the activity name of the activity involved in the constraint violation.	ASCII (40 B)	A valid activity name defined in the PDB. For constraints related to consumables (power, data volume), this field is filled with blanks.
Constraining EOC Activity ID	An integer value that uniquely identifies the activity that is causing the constraint. The ID is formatted as "nnnnnnnn", where "nnnnnnnn" is a unique number assigned to this activity by the EOC when the activity is scheduled. Note: In those cases where an ASTER Activity is not scheduled (Constraint Flag = E), this field will contain the ASTER Activity ID from the STS or ODS.	ASCII (8 B)	nnnnnnnn: 00000000 - 99999999 For constraints related to consumables (power, data volume), this field is filled with blanks.

Table 5-12. Constraint Record (2 of 2)

Field	Description	Type (Length in Bytes)	Values
Constraint Start Time	The constraint start time identifies the time the constraint violation begins. The constraint start time will be identified with the following format: yyyydddhhmmss. For constraints related to consumables (power and data volume), if the constraint start time occurs at a time that is equal to or prior to the Scheduling Data Header "Schedule Start Time", this field will be equal to the "Schedule Start Time".	ASCII (13 B)	yyyy: 1995 - 2100 ddd: 001 - 366 hh: 00 - 23 mm: 00 - 59 ss: 00 - 59
Constraint Stop Time	The constraint stop time identifies the time the constraint violation ends. The constraint stop time will be identified with the following format: yyyydddhhmmss. For constraints related to consumables (power and data volume), if the constraint stop time occurs at a time that is equal to or after the Scheduling Data Header "Schedule Stop Time", this field will be equal to the "Schedule Stop Time".	ASCII (13 B)	yyyy: 1995 - 2100 ddd: 001 - 366 hh: 00 - 23 mm: 00 - 59 ss: 00 - 59
Flag and Error/Constraint Code	The flag & error/constraint code provides information that describes the error or constraint violation. The format of the flag & error/constraint code is "Fnn", where "F" = the flag and "nn" is a valid error/constraint code. Valid flags and error/constraint codes are in Table 5-13.	ASCII (3 B)	See Table 5-13
Constraint Type	The constraint type specifies if the constraint is a "hard" or "soft" constraint. Hard constraints must be resolved prior to generation of the Detailed Activity Schedule	ASCII (1B)	H = hard constraint S = soft constraint
Record Terminator	Identifies the end of this Constraint Record	ASCII (1 B)	\n (new line character)

Table 5-13. Error/Constraint Codes (1 of 2)

Flag	Error/Constraint Code	Explanation
		Planning and Scheduling File Errors
F	01	Unrecognized file. File name does not comply with file naming convention
F	02	Duplicate file name. A unique file name was not provided, as required by the file naming convention
	03 - 09	Spare
		Planning and Scheduling Data Header Errors
F	10	Invalid value in Message Type field
F	11	Invalid Source
F	12	Invalid Destination
F	13	Invalid Spacecraft Name
	14	Spare
F	15	Invalid Scheduling Mode
F	16	Invalid Number of Days in File
F	17	Invalid/Unrecognized Time for Schedule Start Time or Schedule Stop Time
F	18	Stop time is earlier than Start time
F	19	Incomplete file (File contents do not match Number of Records in the Planning and Scheduling Data Header)
F	20	Invalid Number of Resources
F	21	Invalid Resource Name in Scheduling Resource list
F	22	Invalid number of records (i.e., not an integer)
F	23	Unauthorized Resource Name in Scheduling Resource List
	24-35	Spare
		Scheduling Record Errors
E	36	Invalid Scheduling Record Type
E	37	Invalid Instrument/Subsystem Name
E	38	Activity Name not found in PDB
E	39	Invalid Activity ID
E	40	Invalid Orbit Event
E	41	Activity could not be scheduled. FDF orbit event data unavailable.
E	42	Invalid Orbit/Sequence Number
E	43	Invalid Delta Time
E	44	Invalid Resource Value (Power, Data Rate, Pointing Angle)
E	45	Number of Parameters in Activity Record does not match the number of parameters provided in the corresponding Parameter Record
E	46	Number of DAR IDs in Activity Record does not match DAR ID Record
E	47	Unrecognized parameter names (command mnemonic/parameter name or command submnemonic/parameter name)
E	48	Invalid Value specified for parameter
E	49	Missing Parameter (a parameter has not been specified and a default value has not been specified in the Activity definition)
E	50	Invalid Start Time. The start time does not fall within the start/stop range specified in the Planning and Scheduling Header
E	51	User not authorized to schedule this Activity Name

Table 5-13. Error/Constraint Codes (2 of 2)

Flag	Error/Constraint Code	Explanation
E	52	Activity attempts to modify a non-modifiable parameter
E	53	Invalid/Unrecognized start or stop time
E	54	Activity duration is less than the minimum duration defined in the PDB
	55-65	Spare
		Activity Constraint Violations
W	66	Power consumption constraint exceeded
W	67	Data volume constraint exceeded
W	68	Activity prerequisite condition not met (e.g., entry mode violation)
W	69	Constraint violation exists between 2 activities
W	70	Constraint violation exists between activity and orbit event
	71 - 99	Spare

Explanation of Flags:
F = Error; File not processed
E = Error; Activity Record was not processed
W = Warning only; Activity Record was processed

Table 5-14. Comment Record Format

Field	Description	Type (Length in Bytes)	Values
Record Type	Indicates that this is a Comment Record. A comment record is identified by an ASCII "#" in column 1 of the record.	ASCII (1 B)	#
Comment Text	User-defined comment text.	ASCII (<=154 B)	ASCII text
Record Terminator	Identifies the end of the Comment Record	ASCII (1 B)	\n (new line character)

5.5.2 Detailed Data Description

The Request for EOC Schedules is described in Table 5-15. The Planning and Scheduling Data Header is the only record of the Request for EOC Schedules.

Table 5-15. Request for EOC Schedules Format

Field	Description	Type (Length in Bytes)	Values
Planning and Scheduling Data Header	Identifies the type of message being transmitted (REQ) and the time frame covered by the requested EOC schedule data. For Request for EOC Schedules messages, the scheduling mode field will always = "SCHEDULE".	ASCII (variable)	See Table 5-1

5.6 Planning Aids

Planning Aids are automatically sent from the FOS to the ASTER AOS via automated FTP over EBnet. Planning aid files are sent to the ASTER AOS whenever new planning aids are received from the GSFC Flight Dynamics Facility (FDF) and successfully ingested into the FOS. The purpose of Planning Aids are to provide the ASTER AOS with orbital information for use in planning and scheduling the ASTER instrument.

Planning aids that will be sent to the ASTER AOS are:

a. Predicted EOS-AM1 Ephemeris
b. Predicted Orbital Events
c. Predicted Orbit Number and Start Time
d. Predicted Subsatellite Point (Ground Track)
e. Orbit Adjust Maneuver Request
f. Orbit Adjust Burn Times and Duration

Refer to the Earth Observing System (EOS) - AM1 Flight Dynamics Facility (FDF)/EOSDIS Core System (ECS) Interface Control Document for a complete listing of Planning Aid contents and data formats.

5.7 Project Data Base Updates

The ASTER IOT submits changes to the ASTER portion of the AM-1 PDB (command, telemetry, activity, and constraint definitions) through the tools provided in the ECS IST toolkit. PDB updates are validated, approved, and placed under configuration control at the EOC prior to usage in operations.

The ASTER IOT may retrieve AM-1 PDB definitions (command, telemetry, activity, and constraint definitions) through the tools provided in the ECS IST toolkit. The PDB updates may be retrieved in the form of display, reports, or PDB text files. The detailed format of PDB text files are defined in the Flight Operations Segment (FOS) Database Design and Database Schema Specifications for the ECS Project and the Data Format Control Document for the Earth Observing System (EOS) AM-1 Project Data Base.

After the PDB text files have been retrieved from the EOC, these files may be sent by operator-initiated FTP from the ECS IST to the ASTER AOS.

5.8 Absolute Time Command (ATC) Load Report

The purpose of the ATC Load Report is to provide the ASTER ICC with information on the contents of the AM-1 SCC stored command load that was generated from the Detailed Activity Schedule. The ATC Load Report is generated prior to the start of the target day.

The ATC Load Report is accessible through the ECS IST GUI.

Figure 5-3 shows the preliminary layout of the ATC Load Report text file.

```
                 A M - 1   A T C  L O A D  R E P O R T                          PAGE   1

            Mission name                          AM-1
            Satellite ID  (I)                     nn, (Hex =   xx)
            Load name:                            AM1_ATC_xxxxxxxxxxxxxxxxxxxx
            Load creation time:                   yyyy:ddd:hh:mm:ss
            Load execution times - first cmd:     yyyy:ddd:hh:mm:ss
                                 - last cmd:      yyyy:ddd:hh:mm:ss
            Load after time:                      yyyy:ddd:hh:mm:ss
            Load by time:                         yyyy:ddd:hh:mm:ss


            Est. time for uplinking      = 000000
            Load Size in Bytes           = nnnnn
            Primary uplink               = yyyy:ddd:hh:mm:ss
            Secondary uplink             = yyyy:ddd:hh:mm:ss
            Tertiary uplink              = yyyy:ddd:hh:mm:ss
            # commands in load           = nnnn
            # critical commands          = nnnn
            Starting Location #          = nnnn
            Ending Location #            = nnnn

Listing of Control Commands:
Command #   48-bit command data (Octal)     48-bit command data (Hexadecimal)   Decoded data (Hexadecimal)
            ---------------------------     ---------------------------------   -------------------------
  n  =        nnn nnn nnn nnn nnn nnn           xx  xx  xx  xx  xx  xx            xx  xx  xx  xx  xx  xx
----------------------------------------------------------------------------------------------------------

             A M - 1   A T C  L O A D  R E P O R T                                  PAGE   n

 MEMORY        COMMAND         TIME TAGS  INH    COMMAND        SUBMNEMONIC/       CRIT    CMD DATA
LOCATION    EXECUTION TIME      (OCTAL)   GRP    MNEMONIC          VALUE           FLAG    (OCTAL)
---------- ----------------- ----------  ---  -------------   -------------      ----   ------------
  nnn      yyyy:ddd:hh:mm:ss  nnnnnnnnn   nn   Cmd_Mnemonic                         x      nnnnnnnnn
  nnn      yyyy:ddd:hh:mm:ss  nnnnnnnnn   nn   Cmd_Mnemonic     Sub = Value         x      nnnnnnnnn
                                                                Sub = Value         x      nnnnnnnnn
  nnn      yyyy:ddd:hh:mm:ss  nnnnnnnnn   nn   Cmd_Mnemonic     Sub = Value         x      nnnnnnnnn
**************************************************** REPORT END ****************************************************
```

Figure 5-3. ATC Load Report File Layout

5.9 Integrated Report

The purpose of the Integrated Report is to provide the ASTER ICC with information on the operations plan for the target day, including the ground script and the contents of the AM-1 SCC stored command load that was generated from the Detailed Activity Schedule. The Integrated Report is generated prior to the start of the target day.

The Integrated Report is accessible through the ECS IST GUI.

Figure 5-4 shows the preliminary layout of the Integrated Report text file.

5.10 Command Procedures

The ASTER IOT may define Command Procedures and input these Command Procedures to the ECS IST. Command Procedures typically contain a set of ECS Command Language (ECL) directives that perform a single function at the EOC (e.g., configure a portion of the EOC ground system or initiate transmission of commands from the EOC to safe an instrument). After approval, these Command Procedures may be executed in the EOC by the Flight Operations Team (FOT). Command Procedures are classified as either Normal or Contingency.

Command Procedures are input to the ECS IST (Procedure Builder tool). Using an ECS IST tool, the Command Procedure file is sent to the FOT at the EOC for approval. Command Procedures are approved and validated by the EOC prior to use in operations.

Each Command Procedure contains a time ordered listing of ECL directives and optional ECL logic statements. Refer to the ECS IST Toolkit documentation for more information on Command Procedures and the Procedure Builder tool.

5.11 Relative Time Command Sequences

The ASTER IOT may define Relative Time Command Sequences (RTCS) and input these RTCSs to the ECS IST. Approved RTCSs are uplinked and stored onboard the spacecraft. An RTCS is a pre-defined set of commands which performs the same instrument activity on a routine basis. Execution of commands within a RTCS is based on the specified relative time offset between each command.

RTCS are input to the ECS IST through the ECS IST GUI (RTS Load Builder tool). At the request of the ECS IST operator, the RTCS is sent to the FOT at the EOC for approval. RTCSs are approved and validated by the EOC prior to uplink to the spacecraft.

Each RTCS includes a list of command mnemonics (including any submnemonics or required command parameters), a relative time offset for each command, and a text description for each command. Refer to the ECS IST Toolkit documentation for more information on RTCSs and the RTS Load Builder tool.

```
                 A M - 1   I N T E G R A T E D  R E P O R T                      PAGE   1

             Mission name                    AM-1
             Satellite ID  (I)               nn, (Hex =   xx)
             Report file:                    xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.RPT
             Reporting Period Start Time:    yyyy:ddd:hh:mm:ss
             Reporting Period Stop Time:     yyyy:ddd:hh:mm:ss

-----------------------------------------------------------------------------------------------------

                 A M - 1   I N T E G R A T E D  R E P O R T                      PAGE   n

yyyy:ddd:hh:mm:ss     ECL Directive from the Ground Script                                  !Descriptive Text
yyyy:ddd:hh:mm:ss     /Cmd_Mnemonic Submnemonic=Value                                       !Cmd_Description of RT Cmd
yyyy:ddd:hh:mm:ss                    Orbit Event                                            !Label Activity Description

       ATC Loc nnnn   Cmd_Mnemonic           Submnemonic=Value     yyyy:ddd:hh:mm:ss       !Cmd_Description of ATC Cmd
       ATC Loc nnnn   Cmd_Mnemonic           Submnemonic=Value     yyyy:ddd:hh:mm:ss       !Cmd_Description of ATC Cmd

yyyy:ddd:hh:mm:ss     ECL Directive from the Ground Script                                  !Descriptive Text
yyyy:ddd:hh:mm:ss     /Cmd_Mnemonic                                Submnemonic=Value       !Cmd_Description of RT Cmd

       ATC Loc nnnn   Cmd_Mnemonic           Submnemonic=Value     yyyy:ddd:hh:mm:ss       !Cmd_Description of ATC Cmd
       ATC Loc nnnn   Cmd_Mnemonic           Submnemonic=Value     yyyy:ddd:hh:mm:ss       !Cmd_Description of ATC Cmd

yyyy:ddd:hh:mm:ss     MSG "  Start of TDRS Contact  "                                       !ECL Event Msg
yyyy:ddd:hh:mm:ss     AOS:  TDRS_ID  TDRS_Service   Duration       Service_Parameters      !Start of TDRS Service
yyyy:ddd:hh:mm:ss     #ECL comment describing scheduled load uplink
yyyy:ddd:hh:mm:ss     START LOAD_ATC (Loadname.UPL)                                         !Cmd_Procedure Description
yyyy:ddd:hh:mm:ss     /Cmd_Mnemonic                                Submnemonic=Value       !Cmd_Description of RT Cmd

       ATC Loc nnnn   Cmd_Mnemonic           Submnemonic=Value     yyyy:ddd:hh:mm:ss       !Cmd_Description of ATC Cmd

yyyy:ddd:hh:mm:ss     /Cmd_Mnemonic                                Submnemonic=Value       !Cmd_Description of RT Cmd

       RTS RTS#       Cmd_Mnemonic           Submnemonic=Value     yyyy:ddd:hh:mm:ss       !Cmd_Description of RTCS Cmd
       RTS RTS#       Cmd_Mnemonic           Submnemonic=Value     yyyy:ddd:hh:mm:ss       !Cmd_Description of RTCS Cmd

yyyy:ddd:hh:mm:ss     LOS:  TDRS_ID  TDRS_Service                                           !End of TDRS Service
yyyy:ddd:hh:mm:ss     MSG "  End of TDRS Contact  "                !ECL Event Msg

****************************************************** REPORT END ******************************************************
```

Figure 5-4. Integrated Report File Layout

5.12 Real Time Command Requests

The ASTER IOT may prepare Real Time Command Requests and input these Real Time Command Requests to the ECS IST. A Real Time Command Request is used during non-nominal situations to request execution of a selected command procedure at the EOC, transmission of a specified ASTER command to the spacecraft, or execution of a specified RTCS onboard the spacecraft. The Real Time Command Request must be submitted to the ECS FOT prior to the specified real time contact. The time frame for submitting Real Time Command Requests will be defined in the Operations ICD EOS AM Spacecraft to ASTER.

Real Time Command Requests are input to the ECS IST through the ECS IST GUI. At the request of the ECS IST operator, the Real Time Command Request is sent to the FOT at the EOC for approval. The ASTER IOT and the EOC FOT communicate by voice to exchange information regarding the implementation or rejection of a Real Time Command Request.

The FOS provides command verification status of ASTER real time commands to the ASTER AOS via EOC event messages, as described in Section 5.13 - Instrument Real Time Command Notification and Section 5.14 - Instrument Command Uplink Status.

Note: Since the EOC event messages include the command mnemonic of the ASTER real time command and a time stamp, the ASTER IOT can use this information to correlate specific ASTER real time commands to their corresponding command uplink status.

The contents of the Real Time Command Request include:

a. Subject

b. Originator

c. Subsystem or Instrument ID (ASTER)

d. Spacecraft ID (AM-1)

e. Selected EOC command procedure

   1. Time of execution of the command procedure

   2. Listing of the commands in the Command Procedure and their parameters (arguments)

   3. Instructions. (examples of Real Time Command Request instructions are listed in Table 5-16.)

Table 5-16. Real Time Command Request Instructions

Field	Explanation
Label	Unique identifier for this Real Time Command Request
Type	Type of modification (Add, Delete, Change)
Time	The time of execution of a Real Time Command Request. The time is specified in UTC.
Commanding Mode	Desired command mode (one step, two step)
Commands for Execution	Specifies the real time command to be executed (for example): - individual command mnemonic (including submnemonics and parameter values, or - RTCS identifier
Comments	Text explanation or other useful information provided by the ASTER IOT to the EOC FOT

5.13 Instrument Real Time Command Notification

Instrument Real Time Command Notifications[1] are automatically sent from the EOC to the ECS IST at the ASTER ICC. The purpose of Instrument Real Time Command Notifications are to notify the ASTER IOT that the EOC has issued a command to the ASTER instrument during a real time contact. This command may have been issued from the ground script by the EOC FOT as a result of a Real Time Command Request or by the EOC FOT in response to an instrument contingency situation.

Instrument Real Time Command Notification messages are event messages which consist of a time stamp (indicating the time that the event message was generated at the EOC), an event messages which consist of a time stamp (indicating the time that the event message was generated at the EOS), an event message number (for use in referencing FOS Event Message documentation), the command mnemonic of the command that was issued, including any applicable submnemonics and command parameter values.

Instrument Real Time Command Notification is provided to the ASTER IOT through the ECS IST display console in the form of an event message. The ASTER IOT also may request event message reports using the ECS IST user interface.

5.14 Instrument Command Uplink Status

Instrument Command Uplink Status[2] is automatically sent from the EOC to the ECS IST at the ASTER ICC. The purpose of the Instrument Command Uplink Status is to notify the ASTER

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[1] In the FOS Requirements Specification for the ECS Project, these notifications are called "Emergency Notification Messages".

[2] In the FOS Requirements Specification for the ECS Project, these notifications are called "Command Notification Messages".

IOT of the status (command receipt and/or execution verification) of a command that was issued to the ASTER instrument during a real time contact. The command may have been issued from the ground script by the FOT as a result of a Real Time Command Request or by the FOT in response to an instrument contingency situation.

Instrument Command Uplink Status event messages are event messages which consists of a time stamp (indicating the time that the event message was generated), an event message number (for use in referencing FOS Event Message documentation), and a text status field providing the command uplink status information (see Table 5-17).

Instrument Command Uplink Status is provided to the ASTER IOT through the ECS IST display console in the form of an event message. The ASTER IOT also may request event message reports using the ECS IST user interface.

Note: At the beginning of each TDRSS contact, the EOC's spacecraft state check process uses spacecraft housekeeping telemetry data to verify that all ATC commands (with telemetry verification mnemonics specified in the PDB) that were scheduled since the previous TDRSS contact were properly executed. The EOC will generate an event message for each of these ATC commands which fail EOC spacecraft state check verification. The ASTER IOT may use ECS IST capabilities to request EOC Event History Reports. These IST capabilities will be described in the FOS Operations Tools Manual.

Table 5-17. Instrument Command Uplink Status Information

Event Message Status Field
Command *Cmd_Mnemonic* successfully executed
Submnemonic *Submnemonic* not found in command data base
Invalid value *Value* for *Submnemonic* in command *Cmd_Mnemonic*
Not all submnemonics have been entered for command *Cmd_Mnemonic*
Critical command *Cmd_Mnemonic* canceled by operator
Command *Cmd_Mnemonic* prereq fail: param=*Pvalue*, expected *Value1-Value2* **
Prerequisite check overridden by operator for command *Cmd_Mnemonic*
Command *Cmd_Mnemonic* was not received onboard (lost in transmission)
Unable to confirm receipt of command *Cmd_Mnemonic* onboard (TLM dropout)
Command *Cmd_Mnemonic* received onboard; failed execute verification
Command *Cmd_Mnemonic* received onboard; cannot verify execute (TLM static)
Command *Cmd_Mnemonic* received onboard; cannot verify execute (TLM dropout)

** "param" is the telemetry parameter whose value is checked.
Pvalue is the current value of the telemetry parameter.
Value1 - Value2 is the range of acceptable prerequisite values specified in the EOC data base for command *Cmd_Mnemonic*.

5.15 Operations Status Reports

5.15.1 Spacecraft Status Reports

Spacecraft Status Reports are sent from the EOC to the ASTER ICC. The delivery of Spacecraft Status Reports will be accomplished through the use of e-mail services (refer to Section 4.5.3). Status report content, frequency of transmission, and e-mail distribution lists will be negotiated between the ASTER Operations Team (AOT) and the ESDIS EOS Mission Operations Manager (MOM).

5.15.2 Mission Status Reports

Mission Status Reports are sent from the EOC to the ASTER ICC. The delivery of Mission Status Reports will be accomplished through the use of e-mail services (refer to Section 4.5.3). Status report content, frequency of transmission, and e-mail distribution lists will be negotiated between the AOT and the ESDIS EOS MOM.

5.15.3 Instrument Status Reports

Instrument Status Reports are sent from the ASTER ICC to the EOC. The delivery of Instrument Status Reports will be accomplished through the use of e-mail services (refer to Section 4.5.3). Status report content, frequency of transmission, and e-mail distribution lists will be negotiated between the AOT and the ESDIS EOS MOM.

5.16 Inter-instrument Coordination Messages

Inter-instrument Coordination Messages may be exchanged among the ASTER IOT, other AM-1 IOTs, and the FOT at the EOC. The exchange of inter-instrument coordination messages is accomplished through the use of e-mail services (refer to Section 4.5.3). The content of these messages, frequency of transmission, and distribution of these messages are left to the discretion of the EOC FOT and the IOTs.

6. Interfaces Between the ECS SDPS and the ASTER GDS SDPS

6.1 Overview

This section describes the interfaces for data and information exchange between ECS SDPS and ASTER GDS SDPS, including data exchanges in support of catalog interoperability (user search and order), ASTER DAR submittal/statusing, exchange of data shipping notices, orbit data anomaly notifications, and delivery of data products.

6.2 Catalog Interoperability

This section contains a detailed definition of each data interface between ECS and the ASTER GDS that is required to support two-way catalog interoperability. In particular, an identification of each data flow is provided along with a discussion of the functional purpose of that flow and the detailed format and contents of each interface. This section also identifies the mandatory/optional extensions to the V0 protocols that need to be added in order to take advantage of new ECS Version 1 (V1) services.

Since the above-referenced messages are implemented using Object Description Language (ODL), an example of the ODL normalization forms and standardized conventions is provided in Figure 6-1. These standardized conventions, which provide a formal method of describing ODL commands, include the following rules:

a. keywords are words that have a special meaning in ODL, itself, and are treated as instructions.

b. all keyword are printed in CAPS

c. items in square brackets ([ ]) are options.

d. items in parentheses (...) indicate that these items may be repeated any number of times

e. after the parentheses (...) a single character is given that tells how many occurrences are allowed; i.e.,

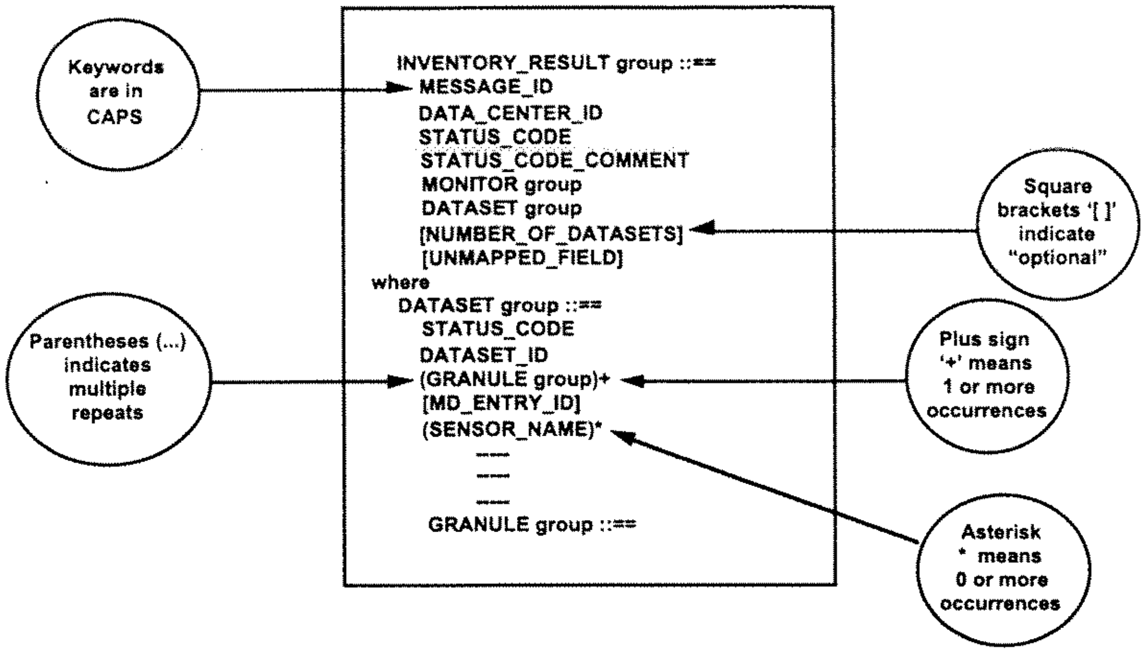
   1. a '*' means zero or more occurrences

   2. a '+' means one or more occurrences

f. Each group is further defined down to its keyword components.

In Appendix B, each keyword is defined in terms of the following items of information, as appropriate:

a. synopsis (short English-Language description of the keyword),



EXAMPLE Only **EXAMPLE Only**

Figure 6-1. Example of ODL Normalization Form Illustrating Conventions

b. parent groups,

c. children,

d. ODL type; e.g.,

   1. integer,
   2. real,
   3. date,
   4. string,
   5. aggregate,
   6. symbol,
   7. sequence string,
   8. character string

e. maximum value length

f. possible values.

6.2.1 Data Flows Between ASTER Gateway and ASTER SDPS Servers For Requests Originating from ECS Users

The data flows between the ASTER Gateway and the ASTER SDPS Servers, for requests originating from ECS users are depicted in Figure 6-2. Specifically, the following data flows are depicted:

a. Inventory Search Request

b. Inventory Search Results

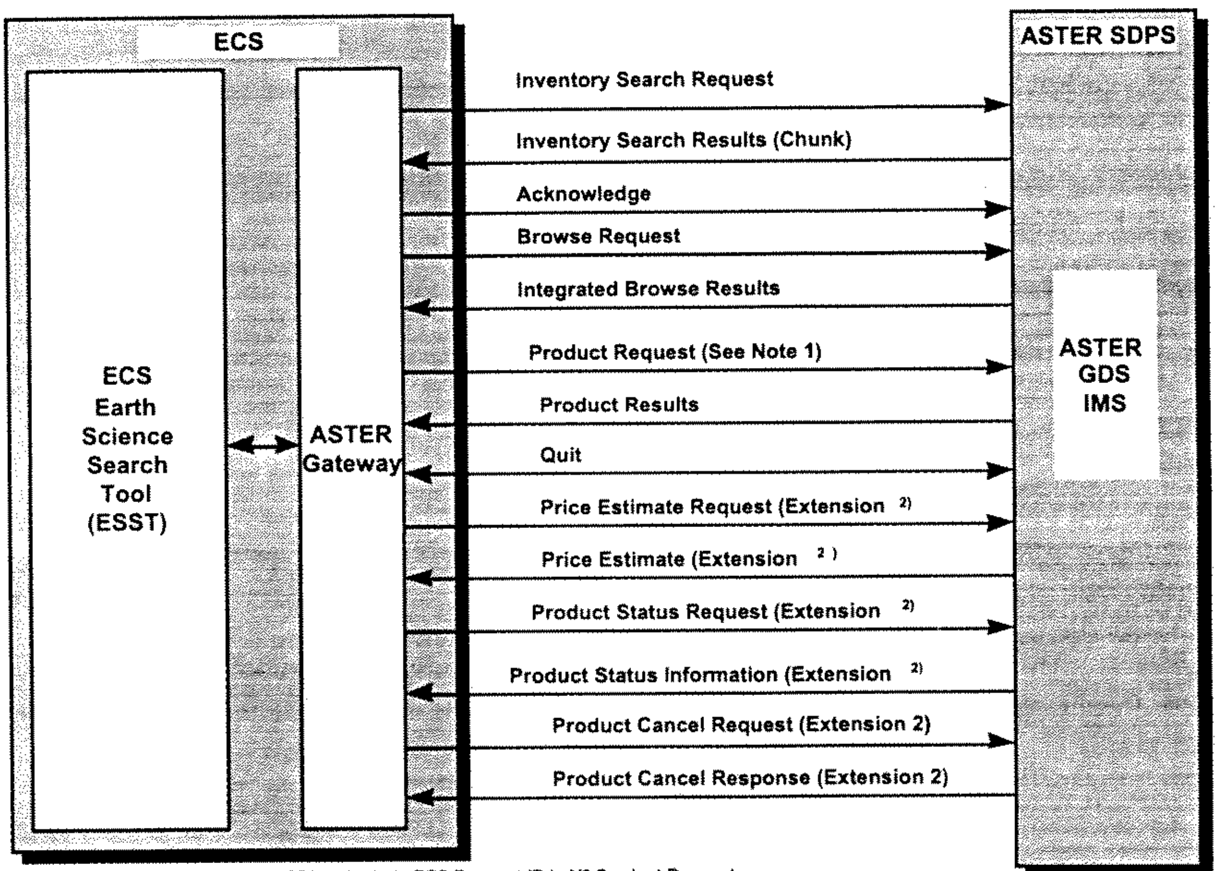
c. Acknowledge

d. Browse Request

e. Integrated Browse Results

f. Product Request

g. Product Results



Note 1: ERSDAC must implement ODL to include ECS Request ID in V0 Product Request.
Note 2: Message which is not supported by V0, but is added to V0 protocol to exploit new ECS V1 services.

Figure 6-2. Interfaces Between ECS Earth Science Search Tool and ASTER SDPS

h. Quit

i. Price Estimate Request (extension*)

j. Price Estimate (extension*)

k. Product Status Request (extension*)

l. Product Status Information (extension*)

m. Product Cancel Request (extension*)

n. Product Cancel Results (extension*)

***Note: An extension is a message which is not supported by Version 0, but is specifically added to the V0 protocol in order to exploit new ECS Version 1 services. ERSDAC has agreed to provide the definition of these extensions.**

All of the messages described above in Figure 6-2 are implemented using Object Description Language (ODL). (For a description of ODL refer to the User's Guide for the Object Description Language Processing Software Library, Release 2.1 - Draft). All of these messages are handled by the IMS Kernel (IK) layer [Note: the ASTER Gateway and the ASTER SDPS IMS contain several software modules, at the communications (lowest) layer, which serve as library routines and are, collectively, referred to as the IK layer]. Each of these messages is described, in detail, in the sections which follow.

The ASTER Gateway translates between these V0 protocols and OODCE/ESQL which is understood by ECS.

6.2.1.1 Directory Information

The ASTER Gateway configuration will include the advertisement of the data sets provided by the ASTER GDS. Using ESQL, the ESST will search the advertising service to retrieve advertisements. This advertisement search is equivalent to a directory search.

6.2.1.2 Inventory Search Request/Results and Acknowledge

The purpose of the inventory search is to aid a user in searching through the available inventory, locating and retrieving metadata about specific granules of the product(s) of interest, and determining whether any granules should be ordered. The search criteria, specified by the user, are based on the following searchable attributes: source, sensor, geophysical parameter, dataset name, data center id, geographical coordinates (area), temporal intervals. An inventory search request for ASTER GDS IMS services, originating from an ECS user, is entered via the ASTER Gateway. The ASTER Gateway sends the ASTER SDPS Servers inventory search criteria based on characteristics of the data. The ASTER SDPS Servers retrieve the requested granules' metadata, and sends these items back to the ASTER Gateway. The basic "building blocks" for a chunk/tree include the following items of information:

a. Inventory Result Prefix - This item of information consists of the following sub-items:

1. Message_ID
2. Data_Center_ID
3. Status Code
4. Status_Code_Comment (optional)
5. Unmapped_Field (optional)

According to the rule, every chunk/tree must contain an Inventory Result Prefix.

b. Package Group - This includes metadata about collections of granules that can be ordered from an archive. The package group can be part of a dataset group or can be outside the dataset groups according to three options to be discussed in the paragraphs below.

c. Dataset Group - This item includes metadata within the Dataset Group. Every chunk may contain 0 or more items of Dataset Group metadata.

d. Granule Group - This item includes metadata within the Granule Group. According to the rule, every chunk will include 0 or more Granule Group information items. It is always part of a dataset group.

A package is collection of granules or data which can be ordered from an archive. An ASTER GDS Server can integrate package information into the chunk/tree according to the following three options:

a. Option 1 - Insert all Package Groups ahead of the first Dataset Group
b. Option 2 - Insert relevant Package Groups ahead of each Dataset Group
c. Option 3 - Embed relevant Package Groups inside each Dataset Group

Although a single INVENTORY_RESULT tree could be transmitted containing the entire response to an INVENTORY_REQUEST, the result would often be a very large tree. To make the socket messages more easily handled, the total result can be sent by servers as a number of smaller trees called chunks, each containing part of the total results. Clients logically merge the chunks back into the total message that form the total inventory results tree. When the V0 protocol was originally being developed, chunks were limited to 64KB in deference to VMS limitations. This size limit is now just a guideline. Many servers control chunking based on number of repeating groups (granules or packages) rather than on number of bytes.

A chunk always begins with the Inventory Result Prefix, which is followed by:

a. some number of package groups and nothing else; or
b. some number of package groups followed by some number of data set groups (possibly containing, in turn, some number of granule groups)
c. some number of data set groups (usually containing granule groups)
d. some number of data set groups (containing package groups and possibly granule groups)

The ASTER Gateway returns a separate acknowledge message to the ASTER SDPS Servers upon receiving each chunk. The Inventory Search Request and Inventory Search Results messages are implemented using ODL---their ODL Normalization Forms are defined in the immediately-following sections. [A discussion of the ODL standardized conventions is provided as reference in Section 4.1. Detailed definitions of the message keywords (e.g., MESSAGE_ID) are provided in Appendix B).

In order to accommodate two-way mapping of terminology between ECS and the ASTER SDPS, the ASTER Gateway maintains a Sybase database containing the terminology mapping information. The ASTER Gateway database is built by a Gateway Administrator using ASTER Gateway search parameters, ECS schema and metadata. Specifically, upon receiving a request from the ECS, the ASTER Gateway performs a ECS-ASTER mapping table look-up within the ASTER Gateway database, converting the ECS request into ASTER SDPS terminology. Similarly, results returned from the ASTER SDPS to the ASTER Gateway are converted, via the ASTER-ECS mapping service, to ECS terminology prior to returning these results to the ECS. The ASTER Gateway-to-Sybase mapping interfaces are completely documented in CDRL #305-CD-023-002, Release B SDPS Data Management Subsystem Design Specification for the ECS Project.

6.2.1.2.1 ODL Normalization Form for Inventory Search Request

The ODL Normalization Form for the ASTER Gateway-to-ASTER SDPS Servers Inventory Search Request (i.e., request originating from ECS user) message is provided below.

```
INVENTORY_SEARCH group ::==
    MESSAGE_ID
    [AUTHENTICATOR]
    [ECS_AUTHENTICATOR]
    GRANULE_LIMIT
    [BROWSE_ONLY]
    [CAMPAIGN]
    [DATASET_ID]
    [SENSOR_NAME]
    [SOURCE_NAME]
    [START_DATE]
    [STOP_DATE]
    [START_DAY_OF_YEAR]
    [STOP_DAY_OF_YEAR]
    [DAY_NIGHT]
    [PROCESSING_LEVEL]
    [PARAMETER]
    [XAR_ID]                                    Note: Only applicable from ECS to ASTER GDS
    [CLOUD_COVERAGE]                            Note: Only applicable from ECS to ASTER GDS
    GlOBAL_GRANULES_ONLY           ||           Note:
    POINT_LOC  group               ||                    One of these five groups must
    POLYGON_LOC  group             ||                    be sent with the search
    RANGE_LOC  group               ||                    (based on user selection).
    XHAIRS  group                  ||
    MONITOR  group
    VERSION group

POINT_LOC group ::==
    LATITUDE
    LONGITUDE
```

```
POLYGON_LOC group ::==
    LATITUDE
    LONGITUDE
    [POLE_INCLUDED]
    MAP_PROJECTION_TYPE
    TANGENT_LATITUDE
    TANGENT_LONGITUDE

RANGE_LOC group ::==
    NORTH_LATITUDE
    SOUTH_LATITUDE
    EAST_LONGITUDE
    WEST_LONGITUDE

XHAIRS group ::==
    LATITUDE
    LONGITUDE
    LATITUDE_DISTANCE
    LONGITUDE_DISTANCE

MONITOR group ::==
    TX_CLIENT
    [RX_SERVER]
    [TX_SERVER]
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.1.2.2 ODL Normalization Form for Inventory Search Results

The ODL Normalization Form for the ASTER SDPS Servers-to-ASTER Gateway Inventory Search Results message is provided below.

Note: Source, sensor and parameter information can be put either in DATASET or GRANULE groups. See annotations.

```
INVENTORY_RESULT group ::==
    MESSAGE_ID
    DATA_CENTER_ID
    STATUS_CODE
    [STATUS_CODE_COMMENT]
    MONITOR group
    VERSION group
    (PACKAGE group)*::==       Note: repeated group
                               OPTION 1: for use when all package information is sent for the
                               whole inventory result.
                               OPTION 2: for use when package information is sent in front of each
                               relevant dataset group.
    (DATASET group)*
    [NUMBER_OF_DATASETS] Note: present only in the last chunk for an inventory results set

    [UNMAPPED_FIELD]

PACKAGE group ::==
    DATA_CENTER_ID
    DATASET_ID
    PACKAGE_ID   Note: The PACKAGE_ID in the PACKAGE group gives an arbitrary identifier by which
       the package is known. Processing and media options for the package are provided in the
       group. GRANULE groups can list multiple packages in which they are available. For the
```

```
      common case where granules can be ordered in single-granule packages and all such packages
      have the same processing and media options, a single package group can be provided whose
      id is "*". Then each granule that can be ordered this way can be listed as being in
      PACKAGE ID "*" (along with possibly other named packages).
    COMMENT
    [INFO_PROMPT]
    NUMBER_OF_GRANULES
    NUMBER_OF_OPTIONS
    (PROCESSING OPTIONS group)+
    (MEDIA_TYPE group)+

PROCESSING_OPTIONS group ::==
    OPTION_ID
    PACKAGE_SIZE.
    NUMBER_OF_MEDIA_TYPE
    (MEDIA_TYPE group)+

MEDIA_TYPE group ::==
    TYPE_ID
    NUMBER_OF_MEDIA_FORMAT
    (MEDIA_FORMAT)+

MEDIA_FORMAT group ::==
    FORMAT_ID
    APPROX_COST

DATASET group ::==
    STATUS_CODE
    DATASET_ID
    (VALID_ACCOUNTS group)*
    (PACKAGE group)*
                                    Note:  OPTION 3: for use when package information is sent
                                    within each relevant dataset group and before the granule
                                    group(s).
    (GRANULE group)*                Note: repeated group
    [MD_ENTRY_ID]
    [SENSOR_NAME]             (See Note 1)
    [SOURCE_NAME]             (See Note 2)
    [PARAMETER]                     (See Note 3)
    [COMMENT]
    [RESTRICTION]
    [CAMPAIGN]
    [DAY_NIGHT]
    [PROCESSING_LEVEL]
    [NUMBER_OF_GRANULE_HITS] Note:  omitted from all chunks except the one containing the last
      granule of the dataset)
    [BROWSE_PRODUCT_DESCRIPTION] Note:  the headings should be done in UPPERCASE on lines by
      themselves in the sequence, i.e. PRIMARY PURPOSE, PRODUCT HISTORY, etc)

VALID_ACCOUNTS group ::==
    ACCOUNT_NUMBER
    [BALANCE]
    [ERROR]

GRANULE group ::==
    GRANULE_ID
    [XAR_ID]
    [SCENE_CLOUD_COVERAGE]
    [QUADRANT_CLOUD_COVERAGE]
    START_DATE
    STOP_DATE
    [SENSOR_NAME]  (See Note 1)
    [SOURCE_NAME]  (See Note 2)
    [PARAMETER]    (See Note 3)
```

```
    [BROWSE_TYPE]
    [CAMPAIGN]
    [COMMENT]
    [DAY_NIGHT]
    [PROCESSING_LEVEL]
    [PACKAGE_ID] Note:  If omitted or if package information is not provided within the inventory
      results, granule cannot be ordered.

    Note 1 - If all granules of the dataset have the same values for SENSOR_NAME, the value can
             be specified in the DATASET group and omitted from all of the GRANULE groups.)

    Note 2 - If all granules of the dataset have the same values for SOURCE_NAME, the value can
             be specified in the DATASET group and omitted from all of the GRANULE groups.)

    Note 3 - If all granules of the dataset have the same values for PARAMETER_NAME, the value
             can be  specified in the DATASET group and omitted from all of the GRANULE groups.)

    GLOBAL_GRANULE
    POINT_LOC group |
    POLYGON_LOC group |
    RANGE_LOC group

POINT_LOC group ::==
    LATITUDE
    LONGITUDE

POLYGON_LOC group ::==
    LATITUDE
    LONGITUDE
    [POLE_INCLUDED]
    CENTROID_LAT
    CENTROID_LON

RANGE_LOC group ::==
    NORTH_LATITUDE
    SOUTH_LATITUDE
    EAST_LONGITUDE
    WEST_LONGITUDE

MONITOR group ::==
    TX_CLIENT
    RX_SERVER
    TX_SERVER
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.1.2.3 ODL Normalization Form for Acknowledge

The ODL Normalization Form for the ASTER Gateway-to-ASTER SDPS Servers Acknowledge message is provided below.

```
ACKNOWLEDGE group ::==
    MESSAGE_ID
    MONITOR group
    VERSION group

MONITOR group ::==
    TX_CLIENT
```

```
    [RX_SERVER]
    [TX_SERVER]
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.1.3 Browse Request/Results

The purpose of the Browse service is to allow the user to request and receive "representative" images for viewing and for analysis prior to deciding on specific full-resolution products to order.

The Integrated Browse service allows the user to view the browse product through the ECS ESST. An integrated browse request sent by the ECS ESST, via the ASTER Gateway, to the ASTER SDPS Servers. The ASTER SDPS Servers send back, via the ASTER Gateway, to the ECS ESST, the integrated browse results message, followed by the browse image which is then displayed to the user.

All ASTER GDS browse images are provided in the National Super Computing Applications (NCSA) Hierarchical Data Format (HDF), Version 4.0.

The Browse Request/Results messages are implemented using ODL---their ODL Normalization Forms are defined in the immediately-following sections. [A discussion of the ODL standardized conventions is provided as a reference in Section 4.1. Detailed definitions of the message keywords (e.g., MESSAGE_ID) are provided in Appendix B].

Integrated browse transmitted in separate files utilize the LAST_BROWSE flag in the INTEGRATED_BROWSE_RESULTS message. The LAST_BROWSE = 0 flag indicates to the client that the final file of the integrated browse has not been transmitted. The LAST_BROWSE flag is set equal to 1 when the last browse file is transmitted. However, this is optional and assumed when omitted. Refer to Figure 6-3 for details on transmission of multiple files in an integrated browse.

6.2.1.3.1 ODL Normalization Form for Browse Request

The ODL Normalization Form for the ASTER Gateway-to-ASTER SDPS Servers Browse Request message is presented below.

```
BROWSE_REQUEST group ::==
    MESSAGE_ID
    [AUTHENTICATOR]
    [ECS_AUTHENTICATOR]
    DATA_CENTER_ID
    USER_AFFILIATION group
BROWSE_TYPE
    BROWSE_GRANULES group
    CONTACT_ADDRESS group
    MONITOR group
    VERSION group
```

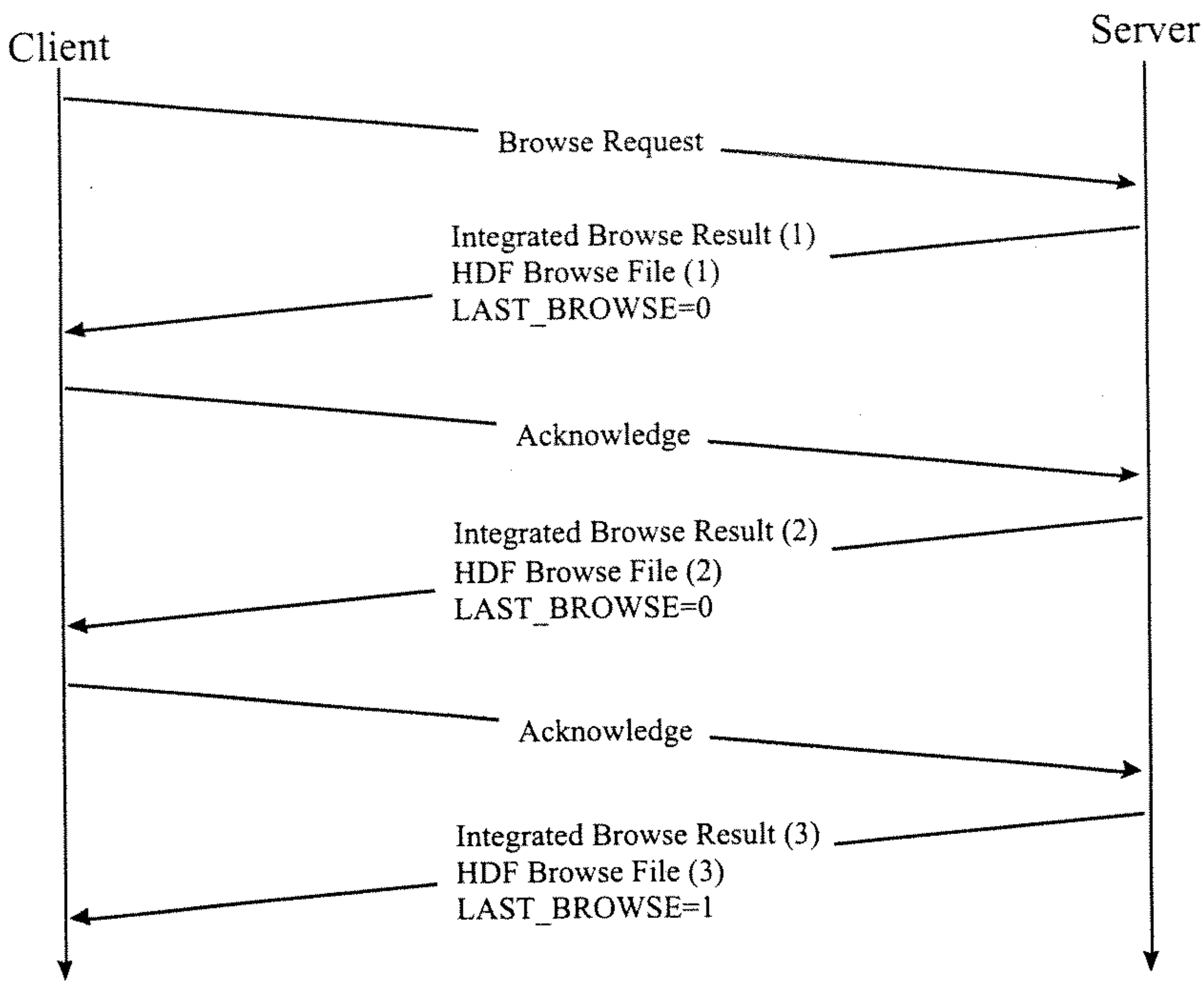


Figure 6-3. Multi-file Integrated Browse

```
BROWSE_GRANULES group::==
    DATASET_ID
    GRANULE_ID

CONTACT_ADDRESS group ::==
     [TITLE]
     LAST_NAME
     FIRST_NAME
     [MIDDLE_INITIAL]
     ORGANIZATION
     ADDRESS
     CITY
     [STATE]
     [ZIP]
     COUNTRY
     PHONE
     [FAX]
     EMAIL
```

```
MONITOR group ::==
    TX_CLIENT
    [RX_SERVER]
    [TX_SERVER]
    [RX_CLIENT]

VERSION group ::==
     PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]

USER_AFFILIATION group ::==
    CATEGORY
    TYPE
```

6.2.1.3.2 ODL Normalization Form for Integrated Browse Results

The ODL Normalization Form for the ASTER SDPS Servers-to-ASTER Gateway Integrated Browse Results message is presented below:

```
INTEGRATED_BROWSE_RESULT::==
    MESSAGE_ID
    STATUS_CODE
    DATA_CENTER_ID
    IMAGE group
    [LAST_BROWSE]
    MONITOR group
    VERSION group

IMAGE group ::==
    DATASET_ID
    GRANULE_ID
    IMAGE_ID
    IMAGE_SIZE

MONITOR group ::==
    TX_CLIENT
    RX_SERVER
    TX_SERVER
    [RX_CLIENT]

VERSION group ::==
     PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

The INTEGRATED_BROWSE_RESULT message is followed by the browse file itself transferred as a binary stream of IMAGE_SIZE bytes. If there are multiple browse files, each has a INTEGRATED_BROWSE _RESULT message before it.

6.2.1.4 Product Request/Result

The Product Request allows the user to order ASTER GDS data products through the ASTER Gateway. After the user has successfully searched, located, and viewed the inventory data for the data sets and selected the granules desired, the user has the option to view certain "}representative"} images. Only at this point is the user permitted to submit a product request if he/she desires. The Product Request is sent from the ASTER Gateway to the ASTER SDPS

Servers. The Product Result is sent from the ASTER SDPS Servers to the ASTER Gateway. The Product Result provides a confirmation of the archive's receipt of the Product Request and provides contact information for further inquiries. The actual product is distributed by the ASTER GDS IMS via physical media. It should be noted that the Product Request must include the ECS Request ID.

6.2.1.4.1 ODL Normalization Form for Product Request

The ODL Normalization Form for the ASTER Gateway-to-ASTER SDPS Servers Product Request message is presented below:

```
PRODUCT_REQUEST group ::==
    MESSAGE_ID
    INITIATOR_REQUEST_ID
    DATA_CENTER_ID
    [AUTHENTICATOR]
    [ECS_AUTHENTICATOR]
    [INITIAL_USER_KEY]
    USER_AFFILIATION group
    CONTACT_ADDRESS group
    [SHIPPING_ADDRESS] group
    [BILLING_ADDRESS] group
    (MEDIA Group)+
    MONITOR group
    VERSION group

MEDIA  group ::==
    MEDIA_TYPE
    MEDIA_FORMAT
    (PRODUCT_DELIVERY group)+

    PRODUCT_DELIVERY group::==
        DATASET_ID
        PACKAGE_ID
        SENSOR_TYPE
        (PRODUCT_GENERATION group)*

        PRODUCT_GENERATION group::==
            PRODUCT_TYPE
            (PARAMETER group)*

            PARAMETER group::==
                PGR_CODE
                PGR_VALUE
            END_GROUP = PARAMETER


USER_AFFILIATION group ::==
    CATEGORY
    TYPE

CONTACT_ADDRESS group ::==
    [TITLE]
    LAST_NAME
    FIRST_NAME
    [MIDDLE_INITIAL]
    ORGANIZATION
    ADDRESS
    CITY
```

```
    [STATE]
    [ZIP]
    COUNTRY
    PHONE
    [FAX]
    EMAIL      Note: for Product Request

SHIPPING_ADDRESS group ::==         Note:  Optional group
    [TITLE]
    LAST_NAME
    FIRST_NAME
    [MIDDLE_INITIAL]
    [ORGANIZATION]
    [ADDRESS]
    CITY
    [STATE]
    [ZIP]
    COUNTRY
    PHONE
    [FAX]
    [EMAIL]

BILLING_ADDRESS group ::==    Note:  Optional group
    [TITLE]
    LAST_NAME
    FIRST_NAME
    [MIDDLE_INITIAL]
    [ORGANIZATION]
    [ADDRESS]       Note: Billing address will be set to a NASA billing address.
    CITY
    [STATE]
    [ZIP]
    COUNTRY
    PHONE
    [FAX]
    [EMAIL]

MONITOR group ::==
    TX_CLIENT
    [RX_SERVER]
    [TX_SERVER]
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.1.4.2 ODL Normalization Form for Product Result

The ODL Normalization Form for the ASTER SDPS Servers-to-ASTER Gateway Product Result message is presented below:

```
PRODUCT_RESULT group ::==
    MESSAGE_ID
    DATA_CENTER_ID
    STATUS_CODE
    [STATUS_CODE_COMMENT]
    (DAAC_CONTACT_ADDRESS group)+              Note: repeatable to support gateways/systems that
       are consortia of multiple archives such as "}ECS"} which has multiple DAACs.   Whenever
       one DATA_CENTER_ID is really multiple contacts for different data sets, this is a way to
       provide those additional contacts.  The name DAAC here remains for historical reasons.
```

```
    MONITOR group
    VERSION group

DAAC_CONTACT_ADDRESS group ::==
    CONTACT_NAME
    ORGANIZATION
    [ADDRESS]
    CITY
    [STATE ]
    [ZIP]
    COUNTRY
    PHONE
    [FAX]
    [EMAIL]

MONITOR group ::==
    TX_CLIENT
    RX_SERVER
    TX_SERVER
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.1.5 Quit

During any given session, problems may necessitate premature termination of the process. In such cases, a bi-directional quit message is transmitted between the ASTER SDPS Servers and the ASTER Gateway, as appropriate. Specifically, the ASTER Gateway sends a quit message to the ASTER SDPS Servers if the user presses the "abort" button on the screen. On the other hand, the quit message is sent by the ASTER SDPS Servers to the ASTER Gateway if an error condition terminates the response. Quit messages are also used to synchronize the ASTER Gateway with the ASTER SDPS Server following the last chunk in an inventory result---the ASTER SDPS Server sends a QUIT with a STATUS_CODE of 1 to the ASTER Gateway.

6.2.1.5.1 ODL Normalization Form for Quit

The ODL Normalization Form for the ASTER SDPS Servers-to-ASTER Gateway Quit Notification is presented below:

```
QUIT group ::==
    MESSAGE_ID
    [DATA_CENTER_ID]
    STATUS_CODE
    [STATUS_CODE_COMMENT]
    [AUTHENTICATOR]
    [ECS_AUTHENTICATOR]
    MONITOR group
    VERSION group

MONITOR group ::==
    [TX_CLIENT]
    [RX_SERVER]
    [TX_SERVER]
    [RX_CLIENT]
```

```
VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.1.6 Product Cancel Request/Result

The operations concept for canceling a request is to first ask for status and obtain the top-level request ID and then each sub-request ID. Given this, the user can attempt to cancel the entire order or an individual request within an order. Therefore, the following message can be used to cancel an order or a sub-request within that order.

6.2.1.6.1 ODL Normalization Form for Product Cancel Request

```
PRODUCT_CANCEL_REQUEST group::==
    MESSAGE_ID
    INITIATOR_REQUEST_ID
    (SUB_REQUEST_ID)*
    MONITOR_group
    VERSION_group

MONITOR group ::==
    TX_CLIENT
    [RX_SERVER]
    [TX_SERVER]
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

If any SUB_REQUEST_Ids are provided, then only those sub-requests are attempted to be canceled. If no SUB-REQUEST_Ids are supplied then entire order is attempted to be canceled. The result message is as follows:

6.2.1.6.2 ODL Normalization Form for Product Cancel Result

```
PRODUCT_CANCEL_RESULT group::==
    MESSAGE_ID
    DATA_CENTER_ID
    STATUS_CODE
    [STATUS_CODE_COMMENT]
    INITIATOR_REQUEST_ID
    [ORDER_STATUS_CODE]
    [ORDER_STATUS_COMMENT]
    (SUB_REQUEST_INFO group)*
    MONITOR group
    VERSION group

SUB_REQUEST_INFO group::==
    SUB_REQUEST_ID
    [REQUEST_STATUS_CODE]
    [REQUEST_STATUS_COMMENT]

MONITOR group ::==
    TX_CLIENT
```

```
    [RX_SERVER]
    [TX_SERVER]
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

This group returns a success/fail and comment for each request attempted to be canceled.

This message proposal was intended to only allow all or part of an INITIATOR_REQUEST_ID to be canceled. Note that the INITIATOR_REQUEST_ID is not repeated. Therefore, there is no need to group the INITIATOR_REQUEST_ID with the SUB_REQUEST_IDs. All the SUB_REQUEST_IDs should relate to the one INITIATOR_REQUEST_ID specified in the request.

6.2.1.7 Product Status Request/Information

6.2.1.7.1 ODL Normalization Form for Product Status Request

```
PRODUCT_STATUS_REQUEST group::==
    MESSAGE_ID
    (INITIATOR_REQUEST_ID)+
    MONITOR group
    VERSION group

MONITOR group ::==
    TX_CLIENT
    RX_SERVER
    TX_SERVER
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

If no INITIATOR_REQUEST_ID is supplied, then all the requests for a given INITIATOR_REQUESTER_ID will be supplied in the result. The results that are returned are in the following message:

6.2.1.7.2 ODL Normalization Form for Product Status Information

```
PRODUCT_STATUS_INFO group::==
    MESSAGE_ID
    DATA_CENTER_ID
    STATUS_CODE
    [ STATUS_CODE_COMMENT]
    (ORDER_STATUS_INFO group)+
    MONITOR group
    VERSION group

ORDER_STATUS_INFO_ group
    INITIATOR_REQUEST_ID
    RECEIVE_DATE                    Note: The date the order was created.
    PLANNED_COMPLETION_DATE
    [COMPLETION_DATE]
```

```
    PRICE
    ORDER_STATUS_CODE
    [ORDER_STATUS_COMMENT]        Note: Description of In Progress  status.
    SHIPPING_ADDRESS_group
    (SUB_REQUEST_STATUS_INFO group)+

    SUB_REQUEST_STATUS_INFO group::==
        SUB-REQUEST_ID              Note: This is the request ID for a portion of the order.
        REQUEST_STATUS_CODE
        [REQUEST_STATUS_COMMENT]
        [COMPLETION_DATE]
                            Note: ASTER GDS doesn't provide COMPLETION_DATE by SUB_REQUEST_ID in
                            STATUS_INFO group. ECS does provide this so the user will know which
                            sub-requests are done, but this can be optional.
        [PROCESSING_DATA_CENTER]        Note: Returned from ECS only
        MEDIA_TYPE
        MEDIA_FORMAT
        DATASET_ID
        [NUMBER_OF_GRANULES]

MONITOR group ::==
    TX_CLIENT
    RX_SERVER
    TX_SERVER
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

ECS requests are not necessarily partitioned by media type. Sometimes, the order may be partitioned by DAAC and then by media type. So the result message may have two subrequests with the same media type, for example, DAAC=GSFC, MEDIA=8mm and DAAC=LaRC, MEDIA=8mm.

6.2.1.8 Price Estimate Request/Result

6.2.1.8.1 ODL Normalization Form for Price Estimate Request

The Price Estimate Request includes product generation parameters

```
PRICE_ESTIMATE_REQUEST group ::==
    MESSAGE_ID
    DATA_CENTER_ID
    (MEDIA group)+                      Note: repeated group

    MONITOR group
    VERSION group

    MEDIA group ::==
        MEDIA_TYPE
        MEDIA_FORMAT
        (PRODUCT_DELIVERY group )+      Note: repeated group

        PRODUCT_DELIVERY group ::==
            DATASET_ID
            PACKAGE_ID
            SENSOR_TYPE
            (PRODUCT_GENERATION group)*     Note: repeated and optional
```

```
        PRODUCT_GENERATION group ::==
            PRODUCT_TYPE
            (PARAMETER group)*

        PARAMETER_group::==
            PGR_CODE
            PGR_VALUE
        END_GROUP = PARAMETER

MONITOR group ::==
    TX_CLIENT
    [RX_SERVER]
    [TX_SERVER]
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.1.8.2 ODL Normalization Form for Price Estimate Result

```
PRICE_ESTIMATE_RESULT group ::==
    MESSAGE_ID
    DATA_CENTER_ID
    STATUS_CODE
    [STATUS_CODE_COMMENT]
    ESTIMATED_PRICE
    [PRICE_COMMENT]
    PREDICTED_COMPLETION_DATE
    MONITOR group
    VERSION group

MONITOR group ::==
    TX_CLIENT
    RX_SERVER
    TX_SERVER
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.2 Data Flows Between ASTER SDPS and ASTER Gateway (or ECS Document Data Server) For Requests Originating From ASTER GDS Users

The data flows between the ASTER SDPS and the ASTER Gateway (or ECS Document Data Server), for requests originating from ASTER SDPS users and results destined for ASTER SDPS users, are depicted in Figure 6-4. Specifically, the following data flows are depicted:

a. Between ASTER SDPS and the ASTER Gateway

    1. Directory Search Request

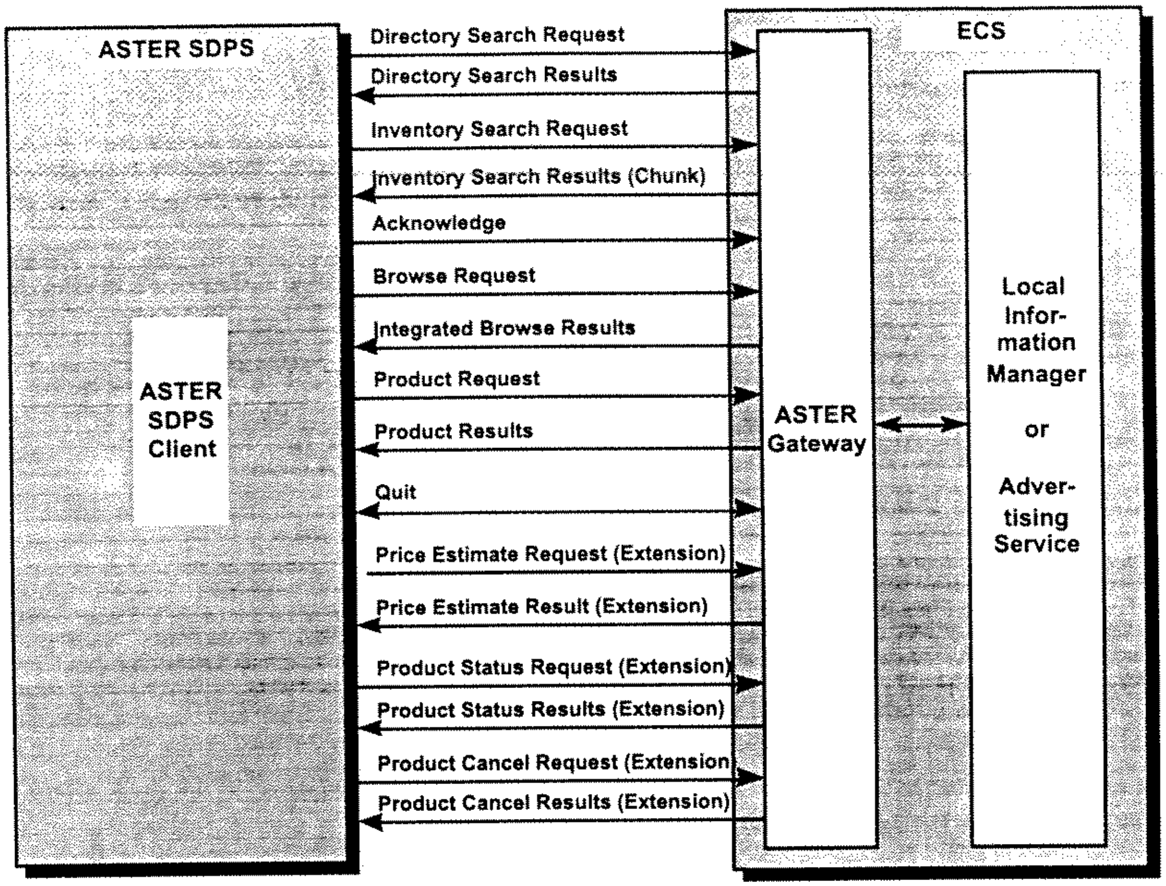


Figure 6-4. Interfaces Between ASTER SDPS and ECS Servers for Catalog Interoperability

2. Directory Search Results
3. Inventory Search Request
4. Inventory Search Results
5. Acknowledge
6. Browse Request
7. Browse Results
8. Product Request
9. Product Results
10. Quit
11. Price Estimate Request (Extension)

12. Price Estimate Result (Extension)
13. Product Status Request (Extension)
14. Product Status Results (Extension)
15. Product Cancel Request (Extension)
16. Product Cancel Results (Extension)

All of the above messages will be implemented using Object Description Language (ODL). (For a description of ODL refer to the User's Guide for the Object Description Language Processing Software Library, Release 2.1 - Draft). All of these messages are handled by the IMS Kernel (IK) layer [Note: The ASTER SDPS and the ASTER Gateway contain several software modules, at the communications (lowest) layer, which serve as library routines and are, collectively, referred to as the IK layer. At this writing, the IK library routines have already been developed/implemented for the V0 System]. Each of these messages is described, in detail, in the sections which follow.

6.2.2.1 Directory Search Request/Results

The purpose of the directory search is to aid the user in making an initial determination of the potential usefulness of various data sets pertinent to some application by searching through descriptions of metadata or data set catalogues which contain high-level information. The directory search provides information on the location of metadata or data set catalogues. The search criteria, specified by the user, are based on the following typical searchable attributes: source, sensor, geophysical parameter, dataset name, data center id, geographical coordinates (area), temporal intervals, etc.. An ASTER user, requesting ECS services, submits the directory search request via the ASTER SDPS. The ASTER SDPS sends the request to the ASTER Gateway.

The Directory Search Request and Directory Search Results messages are implemented using ODL---their ODL Normalization Forms are defined in the immediately-following sections.

6.2.2.1.1 ODL Normalization Form for Directory Search Request

```
DIRECTORY_SEARCH group ::==
    MESSAGE_ID
    [AUTHENTICATOR]
    [ECS_AUTHENTICATOR]
    [CAMPAIGN]
    [DATASET_ID]
    [PARAMETER]
    [SENSOR_NAME]
    [SOURCE_NAME]
    [START_DATE]
    [STOP_DATE]
    [RANGE_LOC group]
    MONITOR group
    VERSION group

MONITOR group ::==
    TX_CLIENT
```

```
    RX_SERVER]
    [TX_SERVER]
    [RX_CLIENT]

RANGE_LOC group ::==
    NORTH_LATITUDE
    SOUTH_LATITUDE
    EAST_LONGITUDE
    WEST_LONGITUDE

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.2.1.2 ODL Normalization Form for Directory Search Result

```
DIRECTORY_RESULT group ::==
    MESSAGE_ID
    DATA_CENTER_ID
    STATUS_CODE
    [STATUS_CODE_COMMENT]
    (DATASET group)+
    NUMBER_OF_DATASETS
    MONITOR group
    VERSION group

DATASET group ::==
    DATASET_ID
        [DATA_SET_CONTACT group]
        DESCRIPTION
        (SOURCE_NAME)*
        (SENSOR_NAME)*
        (DISCIPLINE)+
        (TOPIC)+
        (TERM)+
        (VARIABLE)+
        [START_DATE]
        [STOP_DATE]
        [SPATIAL_COVERAGE group]

        DATA_SET_CONTACT group ::==
            DATA_CENTER_LONGNAME
            [DATA_CENTER_URL]
            [FIRST_NAME]
            [MIDDLE_INITIAL]
            [LAST_NAME]
            PHONE
            [FAX]
            EMAIL
            ADDRESS

        SPATIAL_COVERAGE group ::==
            EASTBOUNDINGCOORDINATE
            WESTBOUNDINGCOORDINATE
            NORTHBOUNDINGCOORDINATE
            SOUTHBOUNDINGCOORDINATE
            [MINIMUM_ALTITUDE]
            [MAXIMUM_ALTITUDE]
            [MINIMUM_DEPTH]
            [MAXIMUM_DEPTH]
```

```
MONITOR group
    TX_CLIENT
    RX_SERVER
    TX_SERVER
    [RX_CLIENT]

VERSION group ::==
    PROTOCOL_VERSION
    SENDER_VERSION
    [IMS_STAFF]
```

6.2.2.2 Inventory Search Request/Results and Acknowledgment

The purpose of the inventory search is to aid a user in searching through the available inventory, locating and retrieving metadata about specific granules of the product(s) of interest, and determining whether any granules should be ordered; and also to allow a user to find datasets if the user chooses not to use a directory or guide search first. The search criteria, specified by the user, are based on the following searchable attributes: source, sensor, geophysical parameter, dataset name, data center id, geographical coordinates (area), temporal intervals, etc. An ASTER GDS user, requesting ECS services, submits the inventory search request via the ASTER SDPS Client. The ASTER SDPS Client sends the ASTER Gateway inventory search criteria based on characteristics of the data. The ASTER Gateway retrieves the requested granules' metadata, and sends these items back to the ASTER GDS IMS in chunks (maximum). The ASTER SDPS returns a separate acknowledge message to the ASTER Gateway upon receiving each chunk (the "chunking protocol" is described in section 6.2.1.3.

The Inventory Search Request and Inventory Search Results messages are implemented using ODL---their ODL Normalization Forms are defined in the immediately-following sections. [A discussion of the ODL standardized conventions is provided as reference in Section 6.2. Detailed definitions of the message keywords (e.g., MESSAGE_ID) are provided in Appendix B].

In order to accommodate two-way mapping of terminology between ECS and the ASTER SDPS, the ASTER Gateway maintains a Sybase database containing the terminology mapping information. The ASTER Gateway database is built by a Gateway Administrator using ASTER Gateway search parameters, ECS schema and metadata. Specifically, upon receiving a request from the ASTER SDPS Client the ASTER Gateway performs a ASTER-ECS mapping table look-up within the ASTER Gateway database, converting the ASTER request into ECS's terminology in order to accommodate ECS Similarly, results returned from ECS to the ASTER Gateway are converted, via the ASTER-ECS mapping service, to ASTER terminology prior to returning these results to the ASTER SDPS Client The ASTER Gateway-to-Sybase mapping interfaces are completely documented in #305-CD-023-002, Release B SDPS Data Management Subsystem Design Specification for the ECS Project.

6.2.2.2.1 ODL Normalization Form for Inventory Search Request

The ODL Normalization Form for the ASTER SDPS Client-to-ASTER Gateway Inventory Search Request message is equivalent to that defined in Section 6.2.1.2.1. with the following exceptions: (1) XAR_ID is not recognized (2) CLOUD_COVERAGE is not recognized.

6.2.2.2.2 ODL Normalization Form for Inventory Search Results

The ODL Normalization Form for the ASTER Gateway-to-ASTER SDPS Client Inventory Search Results message is equivalent to that defined in Section 6.2.1.2.2.

6.2.2.2.3 ODL Normalization Form for Acknowledge

The ODL Normalization Form for the ASTER SDPS Client-to-ASTER Gateway Acknowledge message is equivalent to that defined in Section 6.2.1.2.3.

6.2.2.3 Browse Request/Results

The purpose of the Browse service is to allow the user to request and receive "representative" images for viewing and for analysis prior to deciding on specific full-resolution products to order.

The Integrated Browse service allows the user to view the browse product through the ASTER SDPS Client. In response to an integrated browse request (BROWSE_TYPE = Y) sent by the ASTER SDPS Client, via the ASTER Gateway, to the ECS Science Data Server, the ECS Science Data Server sends back to the ASTER SDPS Client (via the ASTER Gateway) the integrated browse results message, followed by the browse image, which is then displayed to the user.

All Browse image formats are provided in the Hierarchical Data Format (EOS-HDF) from the National Super Computing Applications (NCSA).

The Browse Request/Results messages are implemented using ODL---their ODL Normalization Forms are defined in the immediately-following sections. Detailed definitions of the message keywords (e.g., MESSAGE_ID) are provided in Appendix B.

The ASTER SDPS Client can display the image layers of the ECS browse data files written in HDF-EOS format. This will help the ASTER user to visualize ECS browse images during the selection of data and to verify that the data received is the data desired. It is important to point out that the ASTER SDPS Client is not capable of reading text, table or movie loop documents. The ASTER SDPS Client can also save a browse file in a user-selectable directory for viewing with other viewers such as EOSView.

6.2.2.3.1 ODL Normalization Form for Browse Request

The ODL Normalization Form for the ASTER SDPS Client-to-ASTER Gateway Browse Request message is equivalent to that defined in Section 6.2.1.3.1.

6.2.2.3.2 ODL Normalization Form for Integrated Browse Results

The ODL Normalization Form for the ASTER Gateway-to-ASTER SDPS Client Integrated Browse Results message is equivalent to that defined in Section 6.2.1.3.2.

6.2.2.4 Product Request/Result

The Product Request allows the user to order ECS data products through the ASTER SDPS. After the user has successfully searched, located, and viewed the inventory data for the data sets and selected the granules desired; and (possibly) after the user has viewed certain "representative" browse images, the user may (but is not required to) submit a product request. The Product Request is sent from the ASTER SDPS Client to the ASTER Gateway. The Product Result is sent from the ASTER Gateway to the ASTER SDPS Client. The Product Result provides a confirmation of ECS receipt of the Product Request and provides contact information for further inquiries. The actual product is distributed by ECS via physical media

6.2.2.4.1 ODL Normalization Form for Product Request

The ODL Normalization Form for the ASTER SDPS-to-ASTER Gateway are equivalent to those in Section 6.2.1.4.1.

6.2.2.4.2 ODL Normalization Form for Product Result

The ODL Normalization Form for the ASTER Gateway-to-ASTER SDPS Client are equivalent to those in Section 6.2.1.4.2.

6.2.2.5 Quit

During any given session, problems may necessitate premature termination of the process. In such cases, a bi-directional quit message is transmitted between the ASTER Gateway and the ASTER SDPS Client, as appropriate. Specifically, the ASTER SDPS Client sends a quit message to the ASTER Gateway if the user presses the "abort" button on the screen. On the other hand, the quit message is sent by the ASTER Gateway to the ASTER SDPS Client if an error condition terminates the response. Quit messages are also used to synchronize the ASTER SDPS Client with the ECS Science Data Server following the last chunk in an inventory result---the ECS Science Data Server sends a QUIT with a STATUS_CODE of 1, via the ASTER Gateway, to the ASTER SDPS Client and the ASTER SDPS Client sends a similar QUIT back to the ECS Science Data Server, via the ASTER Gateway.

6.2.2.5.1 ODL Normalization Form for Quit

The ODL Normalization Form for the ASTER SDPS-to-ASTER Gateway are equivalent to those in Section 6.2.1.5.1.

6.2.2.6 Product Cancel Request/Result

The operations concept for canceling a request is to first ask for status and obtain the top-level request ID and then each sub-request ID. Given this, the user can attempt to cancel the entire order or an individual request within an order. Therefore, the following message can be used to cancel an order or a sub-request within that order.

6.2.2.6.1 ODL Normalization Form for Product Cancel Request

The ODL Normalization Form for the ASTER SDPS-to-ASTER Gateway are equivalent to those in Section 6.2.1.6.1.

6.2.2.6.2 ODL Normalization Form for Product Cancel Result

The ODL Normalization Form for the ASTER SDPS-to-ASTER Gateway are equivalent to those in Section 6.2.1.6.2.

6.2.2.7 Product Status Request/Information

6.2.2.7.1 ODL Normalization Form for Product Status Request

The ODL Normalization Form for the ASTER SDPS-to-ASTER Gateway are equivalent to those in Section 6.2.1.7.1.

6.2.2.7.2 ODL Normalization Form for Product Status Information

The ODL Normalization Form for the ASTER SDPS-to-ASTER Gateway are equivalent to those in Section 6.2.1.7.2.

6.2.2.8 Price Estimate Request/Result

6.2.2.8.1 ODL Normalization Form for Price Estimate Request

The ODL Normalization Form for the ASTER SDPS-to-ASTER Gateway are equivalent to those in Section 6.2.1.8.1.

6.2.2.8.2 ODL Normalization Form for Price Estimate Results

The ODL Normalization Form for the ASTER SDPS-to-ASTER Gateway are equivalent to those in Section 6.2.1.8.2.

6.3 Data Acquisition Requests (DARs)

6.3.1 DAR Data Base Information

(Refer to Appendix C: DAR Client Application Programming Interface)

6.3.2 Data Acquisition Request Input Parameters

The DAR input parameters provided by the ASTER GDS specify the required conditions and instrument configuration(s) for filling a user's request for data acquisition(s) by the ASTER instrument. The DAR Input Parameters List is the mechanism by which the ASTER science team conveys its DAR submission preferences to the ASTER GDS API developers. Once the DAR input parameters contained in the API data structure associated with the submitDar call is in agreement with the DAR Input Parameters List, the DAR Input Parameters List will no longer be needed. This is because the content of the DAR Input Parameters List will be fully contained within the API and the API software will be coded solely in accordance with the final API.

This information is provided to the ASTER GDS DAR Client application by the ECS Client via the submitDar call contained in the ASTER GDS API. The ASTER GDS DAR Client application validates the DAR input parameters against an internal data base of valid DAR input values. If the DAR parameters are valid, the ASTER DAR Client application submits the user's DAR to the ASTER GDS SDPS.

Upon submittal to the ASTER GDS SDPS, the DAR Client application obtains a confirmation that the DAR was received by the ASTER GDS. The ASTER GDS DAR Client application returns this confirmation and the assigned DAR ID and DAR request version number to the ECS SDPS Client.

6.3.3 DAR Submit/Results

A user request regarding observations by use of the ASTER instrument will be submitted via the ECS Client software. Subsequently, a registration request of the user request will be issued to the ASTER GDS. DAR parameters will be specified either by the user or the DAR Client software in accordance with the submitDAR call defined in Appendix C. DAR registration information will be sent via the DAR Gateway API and the DAR server in the GDS-IMS, stored in the XAR DB of the GDS-AOS, and used in a scheduling process of the ASTER Instrument operations.

If the DAR submittal is properly accomplished, a XAR ID will be sent back to the user. If the DAR submittal is not properly accomplished, an error message will be sent back to the user.

6.3.4 XAR Modify Request/Results

A modification request regarding a DAR of the ASTER instrument will be submitted to the ASTER-GDS via the ECS Client software. DAR parameters to be modified will be specified by the user in accordance with the data structure associated with the modifyDar call defined in Appendix C. Information on the DAR changes will be sent via the DAR Gateway API and the DAR server in the GDS-IMS, stored in the XAR DB of the GDS-AOS, and used in a scheduling process of the ASTER instrument operations.

After the DAR modifications have been stored, the revised status information will be sent back to the user.

6.3.5 XAR Query

The ECS Client software has the ability to send queries to ASTER-GDS via the DAR Gateway API. The ASTER-GDS software, in turn, transmits ECS queries to the ASTER-AOS database. The ASTER-AOS database searches the database in accordance with the ECS search criteria and creates a response that is returned to the ASTER-GDS software, whereupon it is returned to the ECS Client software via the DAR Gateway API. The DAR Gateway API supports four API calls for queries via the gateway:

a. XAR status

b. Sub-XAR status

c. XAR Contents

Each of these query types are discussed in the following subparagraphs.

6.3.5.1 XAR Status Search Request/Results

XAR Status Search Request regarding observations by use of the ASTER instrument will be submitted via the ECS Client software. Subsequently, a search request will be issued to the ASTER GDS. The XAR search request will be submitted to the DAR server in the GDS-IMS via the DAR Gateway API. The DAR server will retrieve the inventory information of the XAR DB in the GDS-AOS, and send the retrieval results to ECS.

If the XAR Status Search is properly accomplished, the requested XAR status information will be sent back to ECS. If the XAR Status Search is not properly accomplished, an error message will be sent back to ECS.

6.3.5.2 Sub-XAR Status Search Request/Results

The Status Search Request regarding observations by use of the ASTER Instrument will be submitted via the ECS Client software. Subsequently, a search request will be issued to the ASTER GDS. The Sub-XAR search request will be submitted to the DAR server in the GDS-IMS via the DAR Gateway API. The DAR server will retrieve the inventory information of the XAR DB in the GDS-AOS, and send the retrieval results to ECS.

If the Sub-XAR Status Search is properly accomplished, the requested Sub-XAR status information will be sent back to ECS. If the Sub-XAR Status Search is not properly accomplished, an error message will be sent back to ECS.

6.3.5.3 XAR Contents Requests/Results

The XAR Contents Request regarding observations by use of the ASTER Instrument will be submitted to the ASTER GDS via the ECS Client software. The XAR Content Request will be submitted to the DAR server in the GDS-IMS via the DAR Gateway API. The DAR server will retrieve the inventory information of the XAR DB in the GDS-AOS, fetch the requested XAR contents, and send the retrieval results to ECS.

If the XAR Content Request is properly accomplished, the requested XAR contents will be sent back to the user. If the XAR Content Request is not properly accomplished, an error message will be sent back to the user. The XAR Contents Request allows a user to get information on a single XAR.

6.4 Data Products Delivered Via Physical Media

Data products will be delivered by ASTER GDS to ECS via physical media transfer. Details of the data exchange framework, including media specifications, bar coding standards, and Physical Media PDR's are described in Sections 4.6.4.

6.4.1 ASTER Level 1A and 1B Products

The complete list of files that will be included in Level 1A and Level 1B delivery to ECS are identified in section 4.6.3.1 and 4.6.3.2, respectively. The ASTER Level 1A products that are delivered to the EDC DAAC will be in HDF-EOS format. Details of the ASTER Level 1A product format is specified in the ASTER Level 1 Data Products Specification (ASTER GDS Version), which is Appendix D to this document.

6.4.2 Data Shipping Notice

The Data Shipping Notice serves as a routine notice from the ASTER GDS to the ECS DAAC Operations Supervisor at EDC that a shipment of level 1 tapes is being put into the mail. This Data Shipping Notice will identify granule-level information for the level 1 scenes being shipped. This will provide the DAAC with several days advance notice of the arrival of these level 1 granules.

The ASTER GDS will send the Data Shipping Notices via e-mail to the ECS DAAC Operations Supervisor at EDC. The structure of the Data Shipping Notice is shown in Section 4.6.3.8, Figure 4-8, and the format of the Data Shipping Notice is shown in section 4.6.3.8, Table 4-3.

6.4.3 ECS Standard Data Products

ECS standard data products are in HDF-EOS format. The physical media for delivery is selected by the ASTER GDS from a listing of physical media options at the time the product order is placed (refer to Section 4.6 for more information on physical media options).

6.5 Science Software Development and Delivery

6.5.1 ASTER GDS Science Software

By agreement between ESDIS and ERSDAC, the ASTER Level 1a and Level 1b science software will be developed using (at a minimum) the mandatory portions of the ECS Science Data Production (SDP) toolkit. NASA will provide the ECS SDP Toolkit (and updates) to the ASTER GDS.

Science Data Production Software Delivery Packages and Calibration Coefficient Update Packages for ASTER Level 1a and Level 1b science software are delivered by the ASTER GDS SDPS to the ECS SDPS at the EDC DAAC. ASTER science software delivery to the ECS SDPS will be via media delivery (8 mm. tape, 4 mm. tape, CD-ROM).

The details of the science software interfaces for Science Data Production Software Delivery Packages and Calibration Coefficient updates are defined in the sections of the ICD Between ECS and Science Computing Facilities, as noted below:

a. Section 4.6 ECS Ingest Requirements (for Science Software and Calibration Coefficient Delivery)

b. Section 5.1 ECS Software Package External interfaces (for SDP Toolkit Delivery from ECS)

c. Section 5.3.1 Interactive Session Dialog

d. Section 5.4.2 Data Production Software Delivery Package via Media to GSFC

e. Section 5.7 Results of Testing interfaces (Interface Method for Test Products should be Password-protected ftp or Media)

f. Section 5.13.4 Coefficients and SCF-Generated Ancillary Data Update Package Media Ingest.

6.5.2 ECS Science Software for ASTER Standard Products

By agreement between ESDIS and ERSDAC, the ASTER SDPS may submit a request to the ECS SDPS to obtain Data Production Software Delivery Packages for U.S. ASTER science software for higher level standard products. The requested Data Production Software Delivery Packages will be delivered to the ASTER GDS SDPS via physical media.

6.6 Valids Exchange

Valids are exchanged between ECS and ASTER GDS via e-mail. Information about valids formats and definitions is TBD

In the paragraphs below, groups within the [ ] are optional. Values that are repeated within a category are separated by commas. The notes within the < > are just for descriptive purposes. If multiple values are not shown, then a single value is assumed.

A SINGLE_VALUE is of the form: "}some string with double quote marks preceded by \"}

A MULTIPLE_VALUE_LIST is of the form: (SINGLE_VALUE[, SINGLE_VALUE, ...}])

6.6.1 Format for ASTER GDS Valids for ECS

The following describes the valids file format that ASTER GDS creates and sends to ECS. This file contains the information ECS uses for both Data Dictionary valids and directory information. ECS will parse this one file and internally use its components in the Advertising Service and the Data Dictionary as needed.

```
GROUP = VALIDS
    DATA_CENTER_ID = "<data_center_id>"
    GROUP = DATASET
        [CAMPAIGN = " MULTIPLE_VALUE_LIST]"
```

```
DATASET_ID = " SINGLE_VALUE"
SOURCE = "  MULTIPLE_VALUE_LIST"
SENSOR = "  MULTIPLE_VALUE_LIST"
PARAMETER = " MULTIPLE_VALUE"
PROCESSING_LEVEL = "SINGLE_VALUE"  Note: must be one of [0, 1A, 1B, 2, 3, 4]
[DAY_NIGHT_FLAG = " MULTIPLE_VALUE_LIST"
GROUP = DATASET_COVERAGE
    SPATIAL = " SINGLE_VALUE"
    TEMPORAL = "<MM/DD/YYYY - MM/DD/YYYY | present"
END_GROUP = DATASET_COVERAGE
[GROUP = GRANULE_COVERAGE
    SPATIAL = " SINGLE_VALUE"
    TEMPORAL = "SINGLE_VALUE"
END_GROUP = GRANULE_COVERAGE]
GROUP = DEPENDENCY
    /* variable */
END_GROUP  = DEPENDENCY
GROUP = DIRECTORY_PARAMETERS
    DESCRIPTION = "<long description, quotes must be preceded by \>"
    DATASET_SHORT_NAME = "<short name for DATASET_ID>"
    DISCIPLINE= "MULTIPLE_VALUE_LIST"
    TOPIC= "MULTIPLE_VALUE_LIST"
    TERM= "MULTIPLE_VALUE_LIST"
    VARIABLE= "MULTIPLE_VALUE_LIST"
    [GROUP = SPATIAL_COVERAGE
        EASTBOUNDINGCOORDINATE="<float between -180 - +180>"
        WESTBOUNDINGCOORDINATE="<float between -180 - +180>"
        NORTHBOUNDINGCOORDINATE="<float between -90 - +90>"
        SOUTHBOUNDINGCOORDINATE="<float between -90 - +90>"
        [MINIMUM_ALTITUDE="<float>"]
        [MAXIMUM_ALTITUDE="<float>"]
        [MINIMUM_DEPTH="<float>"]
        [MAXIMUM_DEPTH="<float>"]
    END_GROUP = SPATIAL_COVERAGE]
    GROUP = DATA_SET_CONTACT
        DATA_CENTER_LONGNAME="<long name of DATA_CENTER>"
        [DATA_CENTER_URL="<URL to home page of data center>"]
        [FIRST_NAME="<first name of contact person>"]
        [MIDDLE_NAME="<middle name of contact person>"]
        [LAST_NAME="<last name of contact person>"]
        PHONE="<phone number of site>"
        [FAX = "<FAX number at site>"]
        EMAIL="<e-mail of contact person>"
        ADDRESS="<free text including address>"
    END_GROUP = DATA_SET_CONTACT
END_GROUP = DIRECTORY_PARAMETERS
GROUP = SERVICES
    GROUP = BROWSE
        FTP="no"
        INTEGRATED="yes"
    END_GROUP = BROWSE
    GROUP = PGR
        PRODUCT_TYPE= "SINGLE_VALUE"
        SENSOR_TYPE= "MULTIPLE_VALUE_LIST"
        RESOUCE_PRODUCT = "SINGLE or  MULTIPLE_VALUE"
        PGR_SPEC_NUMBER
        GROUP = PGR_SPEC
            PGR_CODE = "SINGLE_VALUE"
            PGR_TYPE = 0 or 1
            PGR_COMMENT = "SINGLE_VALUE"
            PGR_LIST = "MULTIPLE_VALUE_LIST"
            PGR_MAXVALUE = "SINGLE_VALUE"
            PGR_MINVALUE = "SINGLE_VALUE"
```

```
            END_GROUP = PGR_SPEC
        END_GROUP = PGR
        GROUP = PRODUCT_REQUEST
            MEDIA_TYPE = " MULTIPLE_VALUE_LIST"
            MEDIA_FORMAT = " MULTIPLE_VALUE_LIST"
        END_GROUP = "PRODUCT_REQUEST"
    END_GROUP="SERVICES"
  END_GROUP = DATASET
  /*  REPEAT DATASET group for each dataset available through the Gateway. */
END_GROUP = VALIDS
```

6.6.2 Format for ECS Valids for ASTER GDS

The following describes the valids file format that ECS creates and sends to the ASTER GDS. This file is identical to the valids file sent from ASTER GDS to ECS, with the exception that the DIRECTORY group is omitted.

```
GROUP = VALIDS
    DATA_CENTER_ID = "<data_center_id>"
    GROUP = DATASET
        [CAMPAIGN = " MULTIPLE_VALUE_LIST]"
        DATASET_ID = " SINGLE_VALUE"
        SOURCE = "  MULTIPLE_VALUE_LIST"
        SENSOR = "  MULTIPLE_VALUE_LIST"
        PARAMETER = " MULTIPLE_VALUE"
        PROCESSING_LEVEL = "SINGLE_VALUE"                Note: must be one
                                                          of [0, 1A, 1B, 2, 3, 4]
        [DAY_NIGHT_FLAG = " MULTIPLE_VALUE_LIST"
        GROUP = DATASET_COVERAGE
            SPATIAL = " SINGLE_VALUE"
            TEMPORAL = "<MM/DD/YYYY - MM/DD/YYYY | present"
        END_GROUP = DATASET_COVERAGE
        [GROUP = GRANULE_COVERAGE
            SPATIAL = " SINGLE_VALUE"
            TEMPORAL = "SINGLE_VALUE"
        END_GROUP = GRANULE_COVERAGE]
        GROUP = DEPENDENCY
            /* variable */
        END_GROUP  = DEPENDENCY
        GROUP = SERVICES
            GROUP = BROWSE
                FTP="no"
                INTEGRATED="yes"
            END_GROUP = BROWSE
            GROUP = PGR
                PRODUCT_TYPE= "SINGLE_VALUE"
                SENSOR_TYPE= "MULTIPLE_VALUE_LIST"
                RESOUCE_PRODUCT = "SINGLE or  MULTIPLE_VALUE"
                PGR_SPEC_NUMBER
                GROUP = PGR_SPEC
                    PGR_CODE = "SINGLE_VALUE"
                    PGR_TYPE = 0 or 1
                    PGR_COMMENT = "SINGLE_VALUE"
                    PGR_LIST = "MULTIPLE_VALUE_LIST"
                    PGR_MAXVALUE = "SINGLE_VALUE"
                    PGR_MINVALUE = "SINGLE_VALUE"
                END_GROUP = PGR_SPEC
            END_GROUP = PGR
    END_GROUP = DATASET
    /*  REPEAT DATASET group for each dataset available through the Gateway. */
END_GROUP = VALIDS
```

6.7 Guide and Guide Searches

The interface for Guide is unidirectional, from ASTER GDS to ECS. GDS Guide for ASTER will be delivered by the ASTER GDS to the ECS on TBD media. ECS will ingest the GDS Guide and make the documents available as part of the ECS Guide holdings. GDS users will have access to ECS Guide and ECS Guide search capabilities via the internet and http. ECS users will also utilize the ECS Guide for access to the ASTER GDS documents ingested into the ECS.

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7. Interfaces Between the ECS CSMS and the ASTER GDS AOS

7.1 General

This section describes the interfaces between ECS and the ASTER GDS that will be implemented through use of the ECS bulletin board services. Access to ECS Bulletin Board services are available through EBnet connections.

7.2 Long Term Plans

The ASTER GDS access to the EOS Long Term Science Plan (LTSP), Long Term Instrument Plan (LTIP), and the Long Term Spacecraft Operations Plan will be accomplished through EBnet access via ECS bulletin board services. Specified ASTER AOT and IOT addressees will be included in the access group(s) which have access to these messages.

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8. Interfaces Between the ECS CSMS and the ASTER GDS CSMS GSMS

8.1 General

This section describes the system status exchange interfaces between ECS and the ASTER GDS. Communications between ECS CSMS and the ASTER GDS CSMS Ground System Management System (GSMS) will be by e-mail. Exchanged information is system running status information and maintenance scheduling information. This information will be formatted for automated import to and export from the Remedy Action Request System (ARS) on the ECS side and a custom problem tracking system on the Aster GDS side. The interface (ECS CSMS or ASTER GDS CSMS GSMS) whose system running status changes, will send its information to the other interface.

8.2 ECS System Management Data

ECS and ASTER GDS are responsible for exchanging system management information and event notifications. The management information provided in this interface includes notification of events which should be forwarded for informational purposes, and events which directly impact operations between ECS and ASTER GDS. The information will be in a shared schema which allows incorporation into the respective trouble ticketing system.

ASTER GDS shall notify ECS of all scheduled maintenance activities affecting ECS sites nominally 5 days in advance. ASTER GDS shall notify all affected ECS sites directly and will also provide notification to the SMC. The notice will be sent to the SMC where it will be forwarded to affected ECS sites. The notification will provide an estimated time of restoration.

8.3 Detailed Description of the System Management Data

The format for management information notification is via SMTP electronic mail (email) and will be formatted in a machine-parsable form. The template for ECS-ASTER GDS event notification is illustrated in Figure 8-1. This template is also used for notification of maintenance activities. Table 8-1 shows ECS-ASTER GDS Event Notification Message Fields. Table 8-2 shows the mapping between site names and site IDs used in the schema. The Affected Service Identification Table is shown in Table 8-3, and Figure 8-2 contains the GDS_Header, which will be required in transmitting the ECS-ASTER GDS Event Notification Message via e-mail.

The following figure and table show the template for ECS-ASTER GDS Event Notifications, the schema for the template and the associated fields.

8.4 DAR User Profile

The DAR User Profile message will be sent from ECS to ASTER GDS. The DAR User Profile message format is TBR. The standard E-mail message header to be used in the transmission of the DAR User Profile message is provided as Figure 8-2.

```
# Transfer Schema E-mail Template
Schema: Trouble-Ticket-Xfer


Status !536870912!:
EventDescription !536870913!:
StatusLog !536870919!:
Activity        !536870918!:
SourceCreateDate !536870916!:
SourceCloseDate !536870920!:
SourceTicketId !536870914!:
AffectedSites !536870917!:
SourceSiteId !536870921!:
ContactInformation !536870915!:
DestinationSiteId !536870922!:
AffectedService !TBS!:

Note: A blank line must follow the Schema field.
```

Figure 8-1. ECS-ASTER GDS Event Notification Message Format

Table 8-1. ECS-ASTER GDS Event Notification Message Schema Fields (1 of 2)

Field	Field ID	Data Type	Size	Values	Definition
Status	536870912	Selection	4	Open, Closed, Tracking, Information, Rejected	Current status of trouble ticket in its source system. Note, Aster only issues the Open and the Closed status values when sending to ECS. ECS supports all 5 status values. Reason for a status of Rejected can be found in the StatusLog field.
EventDescription	536870913	Character	255		This field contains a short description of the problem. For messages sent by Aster GDS, the field is formatted with "Segment, Subsystem, Service, trouble/maintenance, Explanation". See Table 8-3 for a list of valid service Ids. For messages sent by ECS, the field is completely free form.
SourceTicketId	536870914	Character	15		Trouble ticket id from ticket's source system.
ContactInformation	536870915	Character	255		Name, phone, fax, etc. of responsible person(s) at source site.
SourceCreateDate	536870916	Date/Time	4		Timestamp when ticket was created in source system. GMT
AffectedSites	536870917	Character	255	See table below for current list of supported sites.	Space separated list of site ids for sites affected by event. Note, the sending site may but is not obligated to fill in this field since the receiving site agrees to forward the ticket to affected sites.
Activity	536870918	Character	25		If an outage is determined to be from a planned outage the ticket will be marked as such, otherwise it will be marked unplanned. This field is *NOT* used for scheduling future planned outages.
StatusLog	536870919	Diary	Unlimited		For messages sent by ECS, this field shall contain all diagnostic notes and any other information deemed important to the destination site. All related external trouble tickets received against this problem will be included here and marked "\nEOSXID: SourceTicketNumber\n". The reason for rejecting a messages is included here as well.
SourceCloseDate	536870920	Date/Time	4		Timestamp of when source system closed their ticket. GMT.
SourceSiteId	536870921	Character	30	See table below for current list of supported sites.	Site id of site that sent you this ticket. See Table 8-2 for list of site Ids.

Table 8-1. ECS-ASTER GDS Event Notification Message Schema Fields (2 of 2)

Field	Field ID	Data Type	Size	Values	Definition
DestinationSiteId	536870922	Character	30	See table below for current list of supported sites.	Site id of site that you intend to receive this ticket. See Table 8-2 for list of site Ids.
AffectedService	TBS	Character	30		For messages from Aster GDS, this field is blank since the information is embedded in the EventDescription field.. For messages from ECS this field contains a service identifier. See Table 8-3 for a list of valid service Ids.

Table 8-2. Domain Site to Domain ID Mapping

Domain Sites	Domain IDs
ASTER GDS	ASG
SMC	SMC
EOC	EOC
GSFC	GSF
LaRC	LAR
EDC	EDC
NSIDC	NSC
JPL	JPL
ASF	ASF
ORNL	ORN
ECS EDF	EDF
EDOS	EDO
EBnet	EBN
NSI	NSI

Table 8-3. Affected Service Identification Table

Service Description	Affected Service ID
Aster Data Network	ADN
Aster Operation Segment	AOS
Data Acquisition and Data Storage (Aster)	DADS
Ground System Management System (Aster)	GSMS
Information Management System (Aster)	IMS
Product Generation System (Aster)	PGS
SISS (Aster)	SISS
ECS Aster Gateway	ASGATE
ECS Ingest Server	INGEST
ECS Science Data Server	SDSRV
ECS Document Data Server	DDSRV
ECS Data Distribution Server	DDIST
ECS Order Tracking Server	ORDTRK
ECS DAR Tool	DAR
ECS LIM/DIM	IMSRV
ECS Advertising Server	ADVSRV

Note, the list of services offered at ASG is incomplete.

```
E-mail Contents Header
BEGIN_OBJECT=GDS_Header;        /* Message Sequential Number 0 ~ 999999999(dec) */
Message_Number=123456789;       /* Re-entarant Check Flag "Yes", "No" */
ReEntrantCheck=Yes;             /* Sender ID ECS, GDS */
Sender_ID=GDS;                  /* Receiver ID ECS, GDS */
Receiver_ID=ECS                 /* Operation Mode "Operation", "Test" */
Mode=Operation;                 /* Data Sequential Number 0~999999999(dec) */
Data_Number=0;                  /* End-data Flag "E" or "" */
EndData_Flag=E;                 /* User ID */
Send_Date=1998-08-01;           /* Send Date yyyy-mm-dd */
Send_Time=06:56:12.056;         /* Send Time hh:mm:ss.msc */
END_OBJECT=GDS_Header;
/* End of GDS Header */
BEGIN_OBJECT=DATA
/* Data Descriptin Area */
END_OBJECT=DATA
```

No.	Key	Contents	Value
1	Message_Number	Message serial number in seder segment. A series of Interface sequence is set same number.	"000000000" ~"999999999"(dec) Values are used cyclically.
2	ReEntrantCheck	If this flag is "Yes", same " Message_Number" message can be skipped in Receiver.	"Yes": Check "No": No Check
3	Sender_ID	Identifier of Sender's Segment/Subsystem.	ECS, GDS
4	Receiver_ID	Identifier of Receiver's Segment/Subsystem	Same as Sender_ID
5	Mode	Identifier of Operation Mode / Test Mode.	"Operation" or "Test"
6	Data_Number	Serial Number in the case there are plural data.	"000000000" ~"999999999" (dec)
7	EndData_Flag	Identifier of End data in the case there are plural data.	ASCII Blank (20hex): all data except end one "E": Last data (including in the case of there is only 1 data)
8	Send_Date	Date to send message. Display with yyyy-mm-dd. Use **GMT**. yyyy: Year mm: Month dd: Day	yyyy:0000~9999 mm:01~12 dd:01~28,29,30,31
9	Send_Time	Time to send message. Display with hh:mm:ss.msc. Use **GMT**. hh: Hour (24hour system) mm: Minute ss: Second msc: Milli Second	hh:00~23 mm:00~59 ss:00~59 msc:000~999 Use MSCif necessary. Set 000 if not necessary.

Figure 8-2. Standard E-mail GDS Header

9. Interface Between ECS GSFC DAAC and GDS ADN/DADS for

9.1 Overview

ECS will provide Expedited Data Sets (EDS) to the ASTER GDS for use in evaluating the operation of the instrument. Expedited Data Sets (EDS) are defined as raw satellite telemetry processed into time-ordered instrument packets with packets separated into files for a given downlink contact. The data flow of the EDS is shown in Figure 9-1. The data format and contents of the EDS are illustrated in the ICD Between EDOS and the EOS Ground System (EGS).

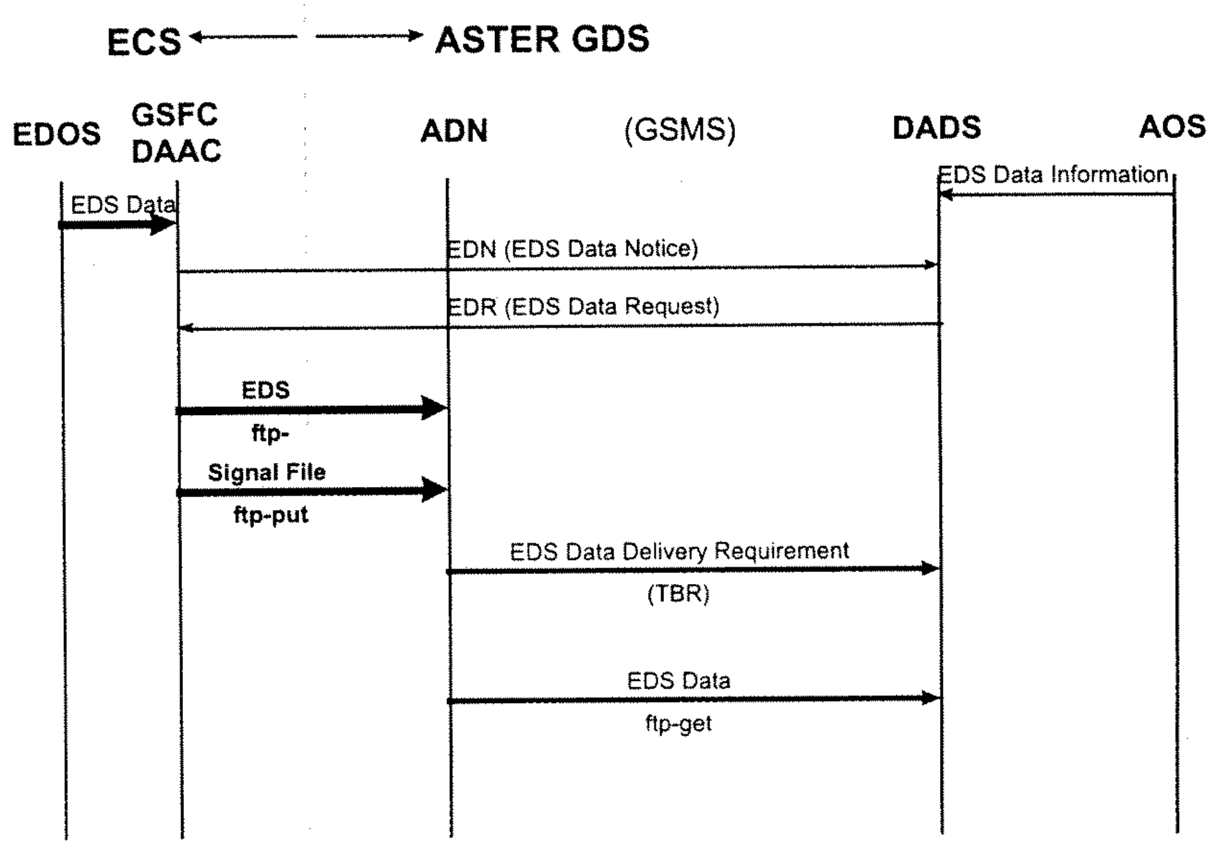

Figure 9-1. EDS Data Transmission Diagram

9.2 EDS Subscription

GSFC DAAC operations will place a subscription to the subscription server, on behalf of the ASTER GDS, once in the beginning of the mission and/or once at a time defined in an Operations Agreement between the ASTER GDS and ECS. Each time the GSFC DAAC receives an EDS from EDOS, the subscription will trigger and automatically cause an e-mail message to be sent to the ASTER GDS DADS, as described below.

9.3 EDS Notification/Request

The GSFC DAAC will automatically notify ASTER GDS DADS each time an ASTER EDS is received from EDOS. This notification will be in the form of an EDS Data Notification (EDN) sent via e-mail, over EBnet. The format of the EDN is shown in Table 9-1 and Table 9-2. ASTER GDS DADS will have the option of ignoring the data notification or requesting EDS based upon the metadata (time range of coverage) contained in the EDN. This request from ASTER GDS DADS will be a EDS Data Request (EDR) sent via e-mail, over Ebnet. The format of the EDR is shown in Table 9-3. Figure 9-2 contains the standard E-mail header to be used when transmitting the EDN and EDR.

Table 9-1. EDS Data Notification (EDN) Format

Parameter	Contents	PVL Date Type	Max Length (Bytes)	Value
OBJECT				'EDS_INFORMATION'
TOTAL_FILE_COUNT	The total number of EDS file. EDS which ASTER GDS side required and EDS which NASA side required is separated to another file.	Integer	4	1-9999
OBJECT	Start of each EDS information. EDS is made by one UNIX file.	-	-	EDS_SPEC
BEGINNING_ DATE/TIME	Date and Time (in GMT) of the first CCSDS packet of the EDS.	date/time	20	yyyy-mm-dd-Thh:mm:ssZ
ENDING_DATE/TIME	Date and Time (in GMT) of the first CCSDS packet of the EDS.	date/time	20	yyyy-mm-dd-Thh:mm:ssZ
APID_COUNT	Number of APIDs in this EDS file.	ASCII	2	≤99
OBJECT	Start of APID specification (repeat for each APID)	ASCII	9	'APID_SPEC'
APID_IN_EDS	Decimal value of the EDOS APID.	ASCII	4	See Next Table
END_OBJECT	End of APID Specification.	ASCII	9	'APID_SPEC'
FILE_ID	File name.	ASCII	256	
FILE_SIZE	File size in Bytes.	integer	10	4.296*10^9
END_OBJECT	End of parameters for each file group.	-	-	'EDS_SPEC'
END_OBJECT	End of EDS information.	-	-	'EDS_INFORMATION'

Table 9-2. EDS Data Notification (EDN) Format

ASTER Data Group	Operation Mode	APIDS in a EDS (in Hex)
VNIR(1)	Observation	x101, x103
VNIR(2)	Observation	x111, x113
SWIR	Observation	x121, x123
TIR	Observation	x131, x133, x132
VNIR(1)	Calibration	x105, x107
VNIR(2)	Calibration	x115, x117
SWIR	Calibration	x125, x127
TIR	Calibration	x135, x137, x136
VNIR(1)	Test	x109, x10B
VNIR(2)	Test	x119, x11B
SWIR	Test	x129, x12B
TIR	Test	x139, x13B, x13A

Table 9-3. EDS Data Request (EDR) Format

Parameter	Contents	PVL Date Type	Max Length (Bytes)	Value
OBJECT				'EDS_DESINFO'
TOTAL_FILE_COUNT	The total number of EDS file.	Integer	4	1-9999
OBJECT	Start of each file information of GSFC DAAC to ftp-put to ASTER GDS.	-	-	'FILE_SPEC'
FILE_ID	File name.	ASCII	256	
FILE_SIZE	File size in Bytes.	integer	10	4.296*10^9
END_OBJECT	End of parameters for each file group.	-	-	'FILE_SPEC'
END_OBJECT	End of EDS information.	-	-	'EDS_DESINFO'

```
E-mail Contents Header
BEGIN_OBJECT=GDS_Header;             /* Message Sequential Number  0 ~ 999999999(dec) */
Message_Number=123456789;            /* Re-entarant Check Flag  "Yes", "No" */
ReEntrantCheck=Yes;                  /* Sender ID  ECS, GDS */
Sender_ID=GDS;                       /* Receiver ID  ECS, GDS */
Receiver_ID=ECS                      /* Operation Mode  "Operation", "Test" */
Mode=Operation;                      /* Data Sequential Number  0~999999999(dec) */
Data_Number=0;                       /* End-data Flag  "E" or "" */
EndData_Flag=E;                      /* User ID */
Send_Date=1998-08-01;                /* Send Date  yyyy-mm-dd */
Send_Time=06:56:12.056;              /* Send Time  hh:mm:ss.msc */
END_OBJECT=GDS_Header;
/* End of GDS Header */
BEGIN_OBJECT=DATA
/*  Data Descriptin Area */
END_OBJECT=DATA
```

No.	Key	Contents	Value
1	Message_Number	Message serial number in seder segment. A series of Interface sequence is set same number.	"000000000" ~"999999999"(dec) Values are used cyclically.
2	ReEntrantCheck	If this flag is "Yes", same " Message_Number" message can be skipped in Receiver.	"Yes": Check "No": No Check
3	Sender_ID	Identifier of Sender's Segment/Subsystem.	ECS, GDS
4	Receiver_ID	Identifier of Receiver's Segment/Subsystem	Same as Sender_ID
5	Mode	Identifier of Operation Mode / Test Mode.	"Operation" or "Test"
6	Data_Number	Serial Number in the case there are plural data.	"000000000" ~"999999999" (dec)
7	EndData_Flag	Identifier of End data in the case there are plural data.	ASCII Blank (20hex): all data except end one "E": Last data (including in the case of there is only 1 data)
8	Send_Date	Date to send message. Display with yyyy-mm-dd. Use **GMT**. yyyy: Year mm: Month dd: Day	yyyy:0000~9999 mm:01~12 dd:01~28,29,30,31
9	Send_Time	Time to send message. Display with hh:mm:ss.msc. Use **GMT**. hh: Hour (24hour system) mm: Minute ss: Second msc: Milli Second	hh:00~23 mm:00~59 ss:00~59 msc:000~999 Use MSCif necessary. Set 000 if not necessary.

Figure 9-2. Standard E-mail Header

9.4 EDS Transmission/Authentication

The EDS file will be transferred from the GSFC DAAC host computer to the ASTER GDS CSMS ADN FTP server by using standard FTP put protocol. Immediately upon completion of the FTP of the data file, ECS will transmit a 'signal file' to the same directory on the receiving host computer. The 'signal file' will be used by the receiving host to identify the completion of the file transfer of the EDS data file. The GSFC DAAC host computer will send a standard UNIX password to ADN ftp for authentication. Registered mail will be used to exchange passwords for ftp authentication.

9.5 Non-Receipt of EDS

In the event that ASTER GDS does not receive requested data, it will communicate with GSFC DAAC via phone or e-mail for problem resolution, as documented in Operations Agreement Between the GSFC DAAC and ASTER GDS SDPS.

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Appendix A. Work-Off Plan

ICD Issue	ICD Para.	ICD Prior-ity	ICD Issue Type - Description	Work-off Plan (Task(s)	Proj. Resolu-tion Date	Risk Assessment**
1	4.4	A	Use of DCE and Kerberos for security authentication in the EOC is TBR	Baseline DCE and Kerberos; awaiting approval confirmation of export license for Keberos. No impact to ASTER GDS development; this is an ECS-internal issue.	1/15/97	Closed
2	4.6.3 Fig 4-6	B	Relationship correspondence of the Product Delivery Record File to the Product File Group is TBR	Meet with ERSDAC on 12/17-19 to resolve issue. Issue was resolved at this meeting.	12/96	Closed
3	4.6 Tble 4-2	B	Format of PDR - Archive_File_Offset, contents, i.e., #of EOFs to be skipped, File_Type (Value Column) Science, Browse, XAR, Granule ID (max length bytes), XAR ID, XAR Type are all TBR	ECS Ingest is working this issue with ERSDAC and anticipates resolving by the due date.	1/15/97	Closed
4	4.6 Tble 4-3	B	Format of Data Shipping Notice - Volume_ID and Create_Date_Time (Value Column) is TBR	Value column has been deleted.	1/15/97	Closed
5	4.6.3.9 Tble 4-6	B	File Naming Convention of L1 Products, i.e., ASTER L1A and ASTER L1B in value column in Product Level is TBR	Same as above	12/96	Closed
6	4.6.3.10 Tble 4-5	B	Definition of Bar Code Format for Media Delivery to EDC - media type (value column) Reprocessed and resent D3 Cassette tape is different from "E". This value is TBD	ECS is awaiting response from ERSDAC.	2/15/97	Schedule for completion of interface design may be affected.

ICD Issue	ICD Para.	ICD Prior-ity	ICD Issue Type - Description	Work-off Plan (Task(s)	Proj. Resolu-tion Date	Risk Assessment**
7	4.3.3	A	ERSDAC recommends adding language which states "File transfers between ECS SDPS and ASTER GDS SDPS for Science S/W Dev. & Delivery are accomplished through standard ftp". There is no ftp connectivity here.	All reference to Science S/W Development and delivery has been removed from this paragraph as agreed by ECS and ERSDAC.	12/96	Closed
8	ERSDAC Proposed Section 10	A	Proposed Data Flow Definition Table, items 21-30 indicate via ftp connection. The ECS IST-EOC I/F is via the IST toolkit furnished by ECS. The protocol to transmit data between ECS IST and EOC is TBD.	This has been determined by ECS; is not an interface with ERSDAC.	12/96	Closed
9	ERSDAC Proposed Section 10	C	Proposed Data Flow Definition Table, items 21-24. There is no requirement for FOS to provide Command Event History Reports to the AOS - but this is a generic capability that is available through the ECS IST. ECS would prefer "not" to show this data flow in the ICD (TBR)	Inclusion of data flow diagram in ICD is TBD. Issue has been assigned to FOS for resolution.	1/15/97	No impact
10	ERSDAC Proposed Section 10	A	In the proposed Data Flow Definition Table (EOSDIS User access to ASTER GDS) items 1-8, indicate that these data flows should be via internet. *This is not correct; these data flows are via Ebnet.*	ECS confirmed that these data flows are Ebnet.	12/96	Closed
11	5.8, 5.9, 5.13, 5.14	A	ERSDAC is considering deleting ICOS2 that has capability of command execution verification from AOS. If ICOS2 is deleted, these data flows between AOS and ECS IST will be deleted. *ECS has no issue with ERSDAC deleting these interfaces.*	ERSDAC is deleting these data flows from ICOS2. These changes have been incorporatedd into this ICD.	12/96	Closed

ICD Issue	ICD Para.	ICD Prior-ity	ICD Issue Type - Description	Work-off Plan (Task(s)	Proj. Resolu-tion Date	Risk Assessment**
12	8, page 8-1, Table 8-1	A	ERSDAC wants to make it an SMC responsibility for notifying affected ECS sites impacted by a planned ASTER maintenance activity. The SMC would have to manually forward the Trouble Ticket (TT) to sites that are impacted by an ASTER maintenance activity. This issue is TBR.	MSS is proceeding with the assumption that SMC operations takes responsibility for manually filling in AffectedSites field of Trouble Ticket and forwarding ticket to impacted sites.	12/96	Closed
13	8, Table 8-2	A	Domain Site to Domain ID Mapping. ASTER asks to extend the existing mapping to include the "Segment, Subsystem, Services" provided at the site. ECS does not concur. This issue is TBR.	Proceeding with MSS proposal to accept this format if ASTER sends it (since it's a freeform field anyway) but not to send it. Instead, MSS will include an AffectedService field specifying service affected.	12/96	Closed
14	4, Figure 4A	C	Figure 4-A Data Flow Diagram via ECS IST Toolkit. The diagram proposed by ERSDAC is not entirely correct. The final recipient of these data flows (ICOS, IASS, ASM) is still TBD.	Figure 4a has been deleted	12/96	Closed
15	Proposed Section 10	C	ERSDAC proposed that Section 10 contain all of the interface diagrams for interface testing. It may be more appropriate to put these data flow diagrams in a test document. This issue is TBR.	Glen Iona/ESDIS and ERSDAC assigned action to determine which test document, if applicable, should contain these referenced interface diagrams for testing.	12/96	No impact
16	Proposed Appendix	C	ECS recommends that the DAR Input Parameter List <u>not</u> be a separate Appendix. Since this information is contained in Table 1 of the DAR API List, a separate Appendix is not needed. This issue is TBR.	ERSDAC concurs that DAR Input Parameter List is part of the DAR Client API List, and should not be a separate Appendix in the ICD.	12/96	Closed

ICD Issue	ICD Para.	ICD Prior-ity	ICD Issue Type - Description	Work-off Plan (Task(s)	Proj. Resolu-tion Date	Risk Assessment**
17	App. B	B	ODL Message Keywords (Objects) needs to be finalized between ECS and ERSDAC.	This issue will be closed pending ERSDAC review of updated ODL Message Keywords contained in Appendix B of 12/23 version of ICD.	2/15/97	Interface design will be incomplete. Status on 1/24/97: Awaiting ERSDAC comments from review of updated ODL Message Keywords.
18	Appx. E	B	ASTER L1A/L1B Data Format Specification Stored in Physical Media TBS by ERSDAC	ECS Jo Pulkkinen determined that ASTER L1A/L1B Data Specification Stored in Physical Media is adequately covered in Section 4 of this ICD and therefore, a separate Appendix is not required.	12/96	Closed.
19	4.6 Fig 4-7	B	Sample Product Delivery Record (PDR) PVL -Data Type=ASTL1A (TBR)	ECS (Karl Cox) has confirmed that the data type for ASTER is L1A and L1B.	1/15/97	Closed
20	6.6	B	Valids Exchange - information about valid formats and definition is TBD.	Valids Exchange information has been incorporated into the ICD.	1/15/97	Closed
21	6.7	B	Guide and Guide Searches - GDS Guide for ASTER will be delivered by TBD media.	Preferred media is D3 tape using standard ECS delivery records. The information in the tape delivery record will identify the tape items (which are documentation) Please note that the implementation of the document data server in ECS has been moved to Release B.1.	1/15/97	Closed
22	6.8	B	DAR User Profile Mail Format is TBS	MSS reviewed format of DAR User Profile provided by ERSDAC and prefers not to build/code a formatted E-mail message. MSS preference is to attach a comma/tab delimited file to an E-mail message with the fields identified in the ASTER response. (TBR)	2/15/97	Schedule for completion of interface design may be affected.

ICD Issue	ICD Para.	ICD Prior-ity	ICD Issue Type - Description	Work-off Plan (Task(s)	Proj. Resolu-tion Date	Risk Assessment**
23	8-3 Fig 8-1	B	#Transfer Schema E-mail Template - AffectedService is TBD	MSS proposed ECS values for this field and submitted for architect office/subsystem review; response from review is pending. ERSDAC indicated that their services list was incomplete but ECS has not received any revisions from them. (TBR)	2/15/97	Interface design will be incomplete and could affect schedule for completion of design.
24	8-3 Tble 8-2	B	AffectedService - TBS	MSS proposed ECS values for this field and submitted for architect office/subsystem review; response from review is pending. ERSDAC indicated that their services list was incomplete but ECS has not received any revisions from them. (TBR)	2/15/97	Interface design will be incomplete and could affect schedule for completion of design.
25	9 TBLs 9-1 and 9-2	B	Contents of Tables 9-1 and 9-2 are TBS	ECS/Shankar Rachakonda will review and revise these tables to include Construction Record and all other files which will be transferred with the EDS.	2/15/97	Interface design will be incomplete and may affect schedule for completion.

ICD Issue	ICD Para.	ICD Prior-ity	ICD Issue Type - Description	Work-off Plan (Task(s)	Proj. Resolu-tion Date	Risk Assessment**
26	App. B Keywrd	B	ACKNOWLEDGE - Synopsis, Parent Group, ODL Type TBD AUTHENTICATION_ID - Synopsis, ODL Type, Max Length TBD CONTENT_NAME - Synopsis, Child Group(s), ODL Type TBD FORMAT_ID Synopsis, Child Group(s), ODL Type TBD INITIATOR_REQUEST_ID - Max Length TBS NUMBER_OF_MEDIA_FORMAT - Synopsis, Child Group(s), ODL Type TBD ORDER_STATUS_INFO - Synopsis, ODL Type TBD PRICE_COMMENT - Synopsis, ODL Type, Max Length TBD PROCESSING_DATA_CENTER - Synopsis, Child Group(s), ODL Type TBD QUADRANT_CLOUD_COVERAGE - ODL Type TBS RECEIVE_DATE - Synopsis, Child_Group(s), ODL Type TBD REQUESTER_ID - Synopsis, Child_Group(s), ODL Type TBD SENSOR_TYPE - Synopsis, Child_Group(s), ODL Type TBD VERSION -Synopsis, ODL Type, Max Length TBD XAR_ID - Max Length TBS XHAIRS - Synopsis, ODL Type. Max Length TBD SERVICE STATE TABLE Process Product Status Request, TX Product Status Info, Process Product Cancel Request, TX Product Cancel Response, Process Price Estimate Request, TX Price Estimate Result	This issue is being agressively worked by both ECS and ERSDAC and is progressing toward completion.	2/15/97	Interface design will be incomplete.

ICD Issue	ICD Para.	ICD Prior-ity	ICD Issue Type - Description	Work-off Plan (Task(s)	Proj. Resolu-tion Date	Risk Assessment**
27	Table 4-2	B	Granule_ID, XAR_INFO_COUNT, XAR_ID and XAR_TYPE - Maximum Length (Bytes) and Value are TBR	Awaiting response from ERSDAC.	2/15/97	Schedule for completion of interface design could be affected.
28	Section 4-9 and 9	C	ECS implementation of expedited data requirement is contingent upon approval of ESD#27.	ECS administrative issue that is aggressively being worked.	2/1/97	Schedule for completion of interface design could be affected.

* Issue Priority Definition:

A = Design impact; e.g., unresolved interface.

B = Minimal design impact; e.g., content or format of a specific field unresolved.

C = No design impact - administrative detail; e.g., reference document # not available.

** Risk Assessment Definition:

1 - Risk if issue is not resolved by CDR

2 - Risk if issue is not resolved by projected resolution date

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Appendix B. ODL Message Keywords (Objects)

B.1 ODL Message Keywords

This section identifies and defines each of the ODL Message keywords corresponding to the ODL descriptions provided in Section 6 of this document. Each keyword is defined, as applicable, in terms of synopsis (short English-Language description of the keyword), parent groups, children, ODL type [e.g., integer, real, date, string, aggregate (i.e., the keyword object contains children), symbol, sequence string (i.e., 0 or more strings entered on separate lines), and character string.], maximum (value) length, and possible values. If no possible values are specified, then any possible value for the stated ODL type is legal. For example, an ACCOUNT_NUMBER may be any string up to 80 characters. The ODL keywords described in this section are derived from the "Messages and Development Data Dictionary - V0 and Release A Message Passing Protocol Specification," 9/95. Section B.2 provides the ODL message keywords which are ASTER GDS extensions to the V0 ODL specification, and section B.3 provides the Server State Table.

Keyword: ACCOUNT_NUMBER
Synopsis: Account identifier provided by a DAAC.
Parent Group(s):VALID_ACCOUNTS
ODL Type: String
Maximum Length: 80
Note: ASTER GDS does not return this keyword, as this Parent Group is (VALID_ACCOUTS)*.

Keyword: ADDRESS
Synopsis: Address information can be entered using three lines.
Parent Group(s): [BILLING_ADDRESS], CONTACT_ADDRESS, [SHIPPING_ADDRESS], [DAAC_CONTACT_ADDRESS], DATA_SET_CONTACT
ODL Type: Sequence String
Field length: 32 x 3 (96)

Keyword: ACKNOWLEDGE
Synopsis: Message group used to acknowledge chunks of an Inventory Results transfer
Parent Group(s): Not used
Child group(s): MESSAGE_ID, MONITOR, VERSION
ODL Type: Aggregate

Keyword: APPROX_COST
Synopsis: Estimated cost for the selected data package.
Parent Group(s): MEDIA_FORMAT
ODL Type: Real

Maximum Length: 16
Possible value(s): 0.0 to 9999999999999.99
Note: Though APPROX_COST is a mandatory keyword, ASTER GDS can not provide the value of this keyword.

Keyword: AUTHENTICATOR
Synopsis: Encrypted value from authentication key, last name, first name. Passed with every request (if authentication key is not blank).
Parent Group(s): [BROWSE_REQUEST], [PRODUCT_REQUEST], [INVENTORY_SEARCH], [DIRECTORY_SEARCH], QUIT
ODL Type: String
Maximum Length: 16
Note: This keyword is not used between ECS and ASTER GDS.

Keyword: BALANCE
Synopsis: Dollar amount remaining for a particular account.
Parent Group(s): [VALID_ACCOUNTS]
ODL Type: Real
Maximum Length: 16
Note: ASTER GDS does not return this keyword.

Keyword: BILLING_ADDRESS
Synopsis: Billing address for data order.
Parent Group(s): [PRODUCT_REQUEST]
Child Group(s): CITY, [EMAIL], [FAX], FIRST_NAME, [MIDDLE_INITIAL], LAST_NAME, PHONE, [STATE], COUNTRY, [ZIP], [TITLE], [ORGANIZATION], [ADDRESS]
ODL Type: Aggregate

Keyword: BROWSE_GRANULES
Synopsis: granule(s) request
Parent Group(s): BROWSE_REQUEST
Child Group(s): DATASET_ID, GRANULE_ID
ODL Type: Aggregate

Keyword: BROWSE_ONLY
Synopsis: Only granules with associated browse images should be returned from the INVENTORY_SEARCH.
Parent Group(s): [INVENTORY_SEARCH]
ODL Type: Symbol
Maximum Length: 1
Possible value(s): Y

Keyword: BROWSE_PRODUCT_DESCRIPTION
Synopsis: Data set specific browse product (image) description
Parent Group(s): [DATASET]

ODL Type: Sequence String
Maximum Length: 80

Keyword: BROWSE_REQUEST
Synopsis: Provide information for obtaining browse image
Child Group(s): BROWSE_TYPE, MESSAGE_ID, MONITOR group, CONTACT_ADDRESS group, BROWSE_GRANULES group, [AUTHENTICATOR], DATA_CENTER_ID, VERSION group, [ECS_AUTHENTICATOR], USER_AFFILIATION
ODL Type: Aggregate

Keyword: BROWSE_TYPE
Synopsis: Type of delivery for browse image
Parent Group(s): BROWSE_REQUEST, [GRANULE]
ODL Type: Symbol
Maximum Length: 8
Possible value(s): Y | N | FTP_Only
Notes:
If Y is in a request, then = 'send integrated browse'.
If Y is in a granule, then = 'available in integrated browse'.
If N is in a granule, then = 'not available'.
If FTP is in granule, then = 'available only as FTP'.
Note: For ASTER GDS only Integrated Browse is utilized.

Keyword: CAMPAIGN
Synopsis: Name of campaign/project that gathered data.
Parent Group(s): [DIRECTORY_SEARCH], [DATASET], [GRANULE], [INVENTORY_SEARCH]
ODL Type: Sequence_String
Maximum Length: 80

Keyword: CATEGORY
Synopsis: Affiliation category for a user
Parent Group(s): USER_AFFILIATION
ODL Type: String
Maximum Length: 7
Possible value(s): USA, NOT USA

Keyword: CENTROID_LAT
Synopsis: Used for part of center point coordinate in the case where a granule is described as a polygon.
Parent Group(s): POLYGON_LOC group for INVENTORY_RESULTS
ODL Type: Real
Maximum Length: 8

Keyword: CENTROID_LON
Synopsis: Used for part of center point coordinate in the case where a granule is described as a polygon.
Parent Group(s): POLYGON_LOC group for INVENTORY_RESULTS
ODL Type: Real
Maximum Length: 8

Keyword: CITY
Synopsis: Name of the city of the associated address
Parent Group(s): BILLING_ADDRESS, CONTACT_ADDRESS, SHIPPING_ADDRESS, DAAC_CONTACT_ADDRESS
ODL Type: String
Maximum Length: 30
Possible value(s): any string

Keyword: COMMENT
Synopsis: Data Center provided information about corresponding granule or data set.
Parent Group(s): [DATASET], [GRANULE], PACKAGE
ODL Type: Sequence String
Maximum Length: 60
Possible value(s): any string

Keyword: CONTACT_ADDRESS
Synopsis: The address portion of a user's contact information.
Parent Group(s): BROWSE_REQUEST, PRODUCT_REQUEST
Child Group(s): CITY, EMAIL, [FAX], FIRST_NAME, [MIDDLE_INITIAL], LAST_NAME, PHONE, [STATE], COUNTRY, [ZIP], [TITLE], ORGANIZATION, ADDRESS
ODL Type: Aggregate

Keyword: CONTACT_NAME
Synopsis: Name of contact for current order fulfillment.
Parent Group(s): DAAC_CONTACT_ADDRESS
ODL Type: String

Keyword: COUNTRY
Synopsis: The name for the country of the associated address
Parent Group(s): SHIPPING_ADDRESS, BILLING_ADDRESS, CONTACT_ADDRESS, DAAC_CONTACT_ADDRESS
ODL Type: String
Maximum Length: 30

Keyword: DAAC_CONTACT_ADDRESS
Synopsis: The Data Center's User Services Office contact information.
Parent Group(s): PRODUCT_RESULT group

Child Group(s): CONTACT_NAME, ORGANIZATION, [ADDRESS], CITY, [STATE], [ZIP], COUNTRY, PHONE, [FAX], [EMAIL]
ODL Type: Aggregate

Keyword: DATA_CENTER_ID
Synopsis: Acronym form of the name of data center transmitting message.
Parent Group(s): DIRECTORY_RESULT, INTEGRATED_BROWSE_RESULT, INVENTORY_RESULT, PRODUCT_RESULT, PRODUCT_REQUEST, PACKAGE, BROWSE_REQUEST, [QUIT], PRODUCT_STATUS_INFO, PRICE_ESTIMATE_REQUEST, PRICE_ESTIMATE_RESULT, PRODUCT_CANCEL_RESULT
ODL Type: Sequence String
Maximum Length: 10

Keyword: DATASET
Synopsis: Group to describe a data set and associated granules from the result set
Parent Group(s): DIRECTORY_RESULT, INVENTORY_RESULT
Child group(s) of DIRECTORY_RESULT: [DATA_SET_CONTACT group], DATASET_ID, DATASET_SUMMARY, DISCIPLINE, [SENSOR_NAME], [SOURCE_NAME], [SPATIAL_COVERAGE group], [START_DATE], [STOP_DATE], TERM, TOPIC, VARIABLE
Child group(s) of INVENTORY_RESULT: [BROWSE_PRODUCT_DESCRIPTION], [CAMPAIGN], [COMMENT], DATASET_ID, [DAY_NIGHT], [GRANULE], [MD_ENTRY_ID], [NUMBER_OF_GRANULE_HITS], [PACKAGE], [PARAMETER], [PROCESSING_LEVEL], [SENSOR_NAME], [SOURCE_NAME], [RESTRICTION], STATUS_CODE, [VALID_ACCOUNTS]
ODL Type: Aggregate

Keyword: DATASET_ID
Synopsis: Name(s) of valid IMS data set(s)
Parent Group(s): DATASET, [DIRECTORY_SEARCH], DIRECTORY_RESULT, IMAGE, [INVENTORY_SEARCH], PACKAGE, PRODUCT_DELIVERY, SUB_REQUEST_STATUS_INFO, BROWSE_GRANULES
ODL Type: Sequence String
Maximum Length: 80

Keyword: DAY_NIGHT
Synopsis: Data gathered during "day" or "night"
Parent Group(s): [GRANULE], [DATASET], [INVENTORY_SEARCH]
ODL Type: Symbol
Maximum Length: 1
Possible value(s): D | N
Note: DATASET unique and is under review.

Keyword: DIRECTORY_RESULT
Synopsis: Provides result of directory level query against data center.

Child Group(s): DATA_CENTER_ID, DATASET Group, MESSAGE_ID, MONITOR group, NUMBER_OF_DATASETS, STATUS_CODE, [STATUS_CODE_COMMENT], VERSION
ODL Type: Aggregate
Note: DIRECTORY_RESULT is returned by only ECS.

Keyword: DIRECTORY_SEARCH
Synopsis: Provides data for directory level search of data center
Child Group(s): [DATASET_ID], MESSAGE_ID, MONITOR group, [RANGE_LOC group], [CAMPAIGN], [PARAMETER], [SENSOR_NAME], [SOURCE_NAME], [START_DATE], [STOP_DATE], [AUTHENTICATOR], [ECS_AUTHENTICATOR], VERSION
ODL Type: Aggregate
Note: DIRECTORY_SEARCH is requested by only ASTER GDS users.

Keyword: EAST_LONGITUDE
Synopsis: Eastern most longitude for an area on the globe
Parent Group(s): RANGE_LOC
ODL Type: Real
Maximum Length: 9
Possible value(s): -180.0000 to +180.0000

Keyword: ECS_AUTHENTICATOR
Synopsis: Optional in every outgoing client message. Used for interfacing with ECS registration.
Parent Group(s): [INVENTORY_SEARCH], [BROWSE_REQUEST], [PRODUCT_REQUEST], [DIRECTORY_SEARCH], [QUIT]
ODL Type: String
Maximum Length: 100

Keyword: EMAIL
Synopsis: Internet e-mail address for associated person
Parent Group(s): [BILLING_ADDRESS], CONTACT_ADDRESS, [SHIPPING_ADDRESS], [DAAC_CONTACT_ADDRESS], DATA_SET_CONTACT
ODL Type: String
Maximum Length: 128
Possible value(s): any string

Keyword: ERROR
Synopsis: Data Center provided freetext information about VALID_ACCOUNTS details. Provides multiple line of information.
Parent Group(s): [VALID_ACCOUNTS]
ODL Type: Sequence string
Maximum Length: 80
Note: ASTER GDS does not return this keyword.

Keyword: FAX
Synopsis: FAX phone number for associated person
Parent Group(s): [BILLING_ADDRESS], [CONTACT_ADDRESS], [SHIPPING_ADDRESS], [DAAC_CONTACT_ADDRESS], [DATA_SET_CONTACT]
ODL Type: String
Maximum Length: 22
Possible value(s): any string

Keyword: FIRST_NAME
Synopsis: The user's first name
Parent Group(s): BILLING_ADDRESS, CONTACT_ADDRESS, SHIPPING_ADDRESS, [DATA_SET_CONTACT]
ODL Type: String
Maximum Length: 20
Possible value(s): any string

Keyword: FORMAT_ID
Synopsis: Description of one possible media distribution format for delivering selected data. One of the FORMAT_IDs listed in the group MEDIA_FORMAT of PACKAGE group in a INVENTORY_RESULT must be returned for ordering that package.
Parent Group(s): MEDIA_FORMAT
ODL Type: String

Keyword: GLOBAL_GRANULE
Synopsis: Granule has global coverage
Parent Group(s): GRANULE
ODL Type: Symbol
Maximum Length: 1
Possible value(s): Y
Note: This keyword maybe used to replace a LOC group if the granule indeed has global coverage.
ASTER GDS has no granule which has global coverage so far.

Keyword: GLOBAL_GRANULES_ONLY
Synopsis: Only global granules should be returned in the result.
Parent Group(s): INVENTORY_SEARCH
ODL Type: Symbol
Maximum Length: 1
Possible value(s): Y
Note: ASTER GDS has no granule which has global coverage so far.

Keyword: GRANULE
Synopsis: Collection of metadata about data granule
Parent Group(s): DATASET

Child Group(s): [BROWSE_TYPE], GRANULE_ID, [PARAMETER], POINT_LOC group, POLYGON_LOC group, [PROCESSING_LEVEL], RANGE_LOC group, [SENSOR_NAME], [SOURCE_NAME], START_DATE, STOP_DATE, [CAMPAIGN], [COMMENT], [DAY_NIGHT], GLOBAL_GRANULE, [PACKAGE_ID], [SCENE_CLOUD_COVERAGE], [QUADRANT_CLOUD_COVERAGE], [XAR_ID]
ODL Type: Aggregate N/A
Notes:
1. One and only one of the groups or keywords defining spatial coverage of the granule is required.
2. PARAMETER and CAMPAIGN are required if provided in the INVENTORY_SEARCH, except for the ASTER GDS.
3. If SENSOR_NAME and SOURCE_NAME are not given the DATASET level, SENSOR_NAME and SOURCE_NAME must be given at the GRANULE level.

Keyword: GRANULE_ID
Synopsis: Granule's ID from Inventory
Parent Group(s): BROWSE_REQUEST, GRANULE, IMAGE
ODL Type: String
Maximum Length: 50
Possible value(s): any string

Keyword: GRANULE_LIMIT
Synopsis: Number of granules requested per data set
Parent Group(s): INVENTORY_SEARCH
ODL Type: Integer
Maximum Length: 10
Possible value(s): 1 to 2147483647

Keyword: IMAGE
Synopsis: Provides attributes of an image
Parent Group(s): INTEGRATED_BROWSE_RESULT
Child Group(s): DATASET_ID, GRANULE_ID, IMAGE_ID, IMAGE_SIZE
ODL Type: Aggregate

Keyword: IMAGE_ID
Synopsis: Image identifier from Data Center
Parent Group(s): IMAGE group
ODL Type: String
Maximum Length: 30
Possible value(s): any string

Keyword: IMAGE_SIZE
Synopsis: Image size in bytes
Parent Group(s): IMAGE group
ODL Type: String

Maximum Length: 10
Possible value(s): 1 to 2147483647

Keyword: IMS_STAFF
Synopsis: Sent with every client message. Usually blank unless the client was run by a member of the IMS Staff. It comes from the IMS staff environment variable (shell set).
Parent Group(s): [VERSION]
ODL Type: String
Note: ASTER GDS does not return this keyword.

Keyword: INFO_PROMPT
Synopsis: Data Center-supplied string to describe use of 'additional info' on the Order screen.
Parent Group(s): [PACKAGE]
ODL Type: String
Maximum Length: 80
Note: ASTER GDS does not return this keyword.

Keyword: INITIAL_USER_KEY
Synopsis: Set by shell for Data Center hosted clients. Original password used at the Data Center when first registering a user.
Parent Group(s): [PRODUCT_REQUEST]
ODL Type: String
Maximum Length: 12
Note: This keyword is not used between ECS and ASTER GDS.

Keyword: INTEGRATED_BROWSE_RESULT
Synopsis: Provides result of BROWSE_REQUEST
Child Group(s): DATA_CENTER_ID, IMAGE group, MESSAGE_ID, MONITOR Group, STATUS_CODE, [LAST_BROWSE], VERSION
ODL Type: Aggregate

Keyword: INVENTORY_RESULT
Synopsis: Provides result set from inventory query
Child Group(s): DATA_CENTER_ID, MESSAGE_ID, MONITOR group, [NUMBER_OF_DATASETS], STATUS_CODE, [DATASET group], [UNMAPPED_FIELD], [STATUS_CODE_COMMENT], [PACKAGE], VERSION
ODL Type: Aggregate

Keyword: INVENTORY_SEARCH
Synopsis: Provides data to perform inventory query
Child Group(s): GRANULE_LIMIT, MESSAGE_ID, MONITOR group, [BROWSE_ONLY], [CAMPAIGN,] [DATASET_ID], [DAY_NIGHT], GLOBAL_GRANULES_ONLY, [PARAMETER], POINT_LOC group, POLYGON_LOC group, [PROCESSING_LEVEL], RANGE_LOC group, [SENSOR_NAME], [SOURCE_NAME], [START_DATE], [START_DAY_OF_YEAR], [STOP_DATE],

[STOP_DAY_OF_YEAR], [AUTHENTICATOR], [ECS_AUTHENTICATOR], [XAR_ID], [CLOUD_COVERAGE], XHAIRS, VERSION

ODL Type: Aggregate

Note: For Requests Originating from ASTER GDS users, one and only one type of spatial coverage is required in the INVENTORY_SEARCH group and at least one of the DATASET_ID, SENSOR_NAME, or PARAMETER keywords.

For Requests Originating from ECS users, one type of spatial coverage is required in the INVENTORY_SEARCH group and at least one of the DATASET_ID or SENSOR_NAME keywords. Because ASTER GDS might not define values of "PARAMETER", ASTER GDS Product Search by "PARAMETER" was eliminated.

Keyword: LAST_NAME

Synopsis: The user's last name.

Parent Group(s): BILLING_ADDRESS, CONTACT_ADDRESS, SHIPPING_ADDRESS, [DATA_SET_CONTACT]

ODL Type: String

Maximum Length: 20

Keyword: LAST_BROWSE

Synopsis: Used in integrated browse to indicate the last browse in a series has not been received.

Parent Group(s):[INTEGRATED_BROWSE_RESULT]

ODL Type: Symbol

Maximum Length: 1

Possible values: 0, 1

Note: If LAST_BROWSE = 0, then the final file of the integrated browse has not been transmitted.

If LAST_BROWSE = 1, when the last browse file is transmitted.

Keyword: LATITUDE

Synopsis: Latitude for a point on the globe.

Parent Group(s): POINT_LOC, POLYGON_LOC, XHAIRS

ODL Type: Sequence Real

Maximum Length: 8

Possible value(s): -90.0000 to +90.0000

Keyword: LATITUDE_DISTANCE

Synopsis: Degrees separating center point and latitude corner point.

Parent Group(s): XHAIRS

ODL Type: String

Maximum Length: 9

Keyword: LONGITUDE

Synopsis: Longitude for a point on the globe.

Parent Group(s): POINT_LOC, POLYGON_LOC, XHAIRS

ODL Type: Sequence Real

Maximum Length: 9
Possible value(s): -180.0000 to +180.0000

Keyword: LONGITUDE_DISTANCE
Synopsis: Degrees separating center point and longitude corner point.
Parent Group(s): XHAIRS
ODL Type: String
Maximum Length: 10

Keyword: MAP_PROJECTION_TYPE
Synopsis: Map projection type selected by the user.
Parent Group(s): POLYGON_LOC group for INVENTORY_SEARCH
ODL Type: String
Maximum Length: 80
Possible value(s): PLATE_CARREE, NORTH_POLAR_STEREOGRAPHIC, SOUTH_POLAR_STEREOGRAPHIC

Keyword: MD_ENTRY_ID
Synopsis: Global Change Master Directory Entry ID
Parent Group(s): [DATASET]
ODL Type: String
Maximum Length: 31
Possible value(s): any string

Keyword: MEDIA_FORMAT
Synopsis: Media distribution format for delivering selected data.
Parent Group(s): MEDIA, MEDIA_TYPE, SUB_REQUEST_STATUS_INFO
Child Group(s): APPROX_COST, FORMAT_ID
ODL Type: String, Aggregate (see note)
Maximum Length: 30, group (see note)
Note: MEDIA_FORMAT is used in two contexts:

1. Under MEDIA group and SUB_REQUEST_STATUS_INFO group, the values are user selected identifying the distribution format for delivery of the data.
2. Under MEDIA_TYPE group this are subgroup names.

Keyword: MEDIA_TYPE
Synopsis: The distribution media for delivering selected data.
Parent Group(s): MEDIA, PACKAGE, PROCESSING_OPTIONS, SUB_REQUEST_STATUS_INFO
Child Group(s): TYPE_ID, NUMBER_OF_MEDIA_FORMAT, MEDIA_FORMAT
ODL Type: String, Aggregate (see note)
Maximum Length: 20, group (see note)
Note: MEDIA_TYPE is used in two contexts:

1. Under MEDIA group and SUB_REQUEST_STATUS_INFO group, the values are user selected identifying the distribution format for delivery of the data.

2. Under PROCESSING_OPTIONS and PACKAGE group this are subgroup names.

Note: MEDIA_TYPE is a child of PACKAGE in the INVENTORY_RESULT message.

Keyword: MESSAGE_ID
Synopsis: Identifier used to track messages.
Parent Group(s): BROWSE_REQUEST, DIRECTORY_RESULT, DIRECTORY_SEARCH, INTEGRATED_BROWSE_RESULT, INVENTORY_RESULT, INVENTORY_SEARCH, PRODUCT_REQUEST, PRODUCT_RESULT, ACKNOWLEDGE, QUIT, PRODUCT_STATUS_REQUEST, PRODUCT_STATUS_INFO, PRICE_ESTIMATE_REQUEST, PRICE_ESTIMATE_RESULT, PRODUCT_CANCEL_REQUEST, PRODUCT_CANCEL_RESULT
ODL Type: String
Maximum Length: 30
Possible value(s): any string
Note: Generated by Gaea, the IMS client software.

Keyword: MIDDLE_INITIAL
Synopsis: One letter initial for the user's middle name.
Parent Group(s): [BILLING_ADDRESS], [CONTACT_ADDRESS], [SHIPPING_ADDRESS], [DATA_SET_CONTACT]
ODL Type: String
Maximum Length: 1

Keyword: MONITOR
Synopsis: Collection of performance statistics.
Parent Group(s): BROWSE_REQUEST, DIRECTORY_RESULT, DIRECTORY_SEARCH, INTEGRATED_BROWSE_RESULT, INVENTORY_RESULT, INVENTORY_SEARCH, PRODUCT_REQUEST, PRODUCT_RESULT, ACKNOWLEDGE, QUIT, PRODUCT_CANCEL_REQUEST, PRODUCT_CANCEL_RESULT, PRODUCT_STATUS_REQUEST, PRODUCT_STATUS_INFO, PRICE_ESTIMATE_REQUEST, PRICE_ESTIMATE_RESULT
Child Group(s): [RX_CLIENT], [RX_SERVER], TX_CLIENT, [TX_SERVER]
ODL Type: Aggregate
Maximum Length: 84

Keyword: NORTH_LATITUDE
Synopsis: Northern most latitude for an area on the globe.
Parent Group(s): RANGE_LOC
ODL Type: Real
Maximum Length: 8
Possible value(s): -90.0000 to +90.0000

Keyword: NUMBER_OF_DATASETS
Synopsis: Number of data sets included in query result set.

Parent Group(s): DIRECTORY_RESULT, [INVENTORY_RESULT]
ODL Type: Integer
Maximum Length: 10
Possible value(s): 1 to 2147483647

Keyword: NUMBER_OF_GRANULES
Synopsis: The number of granules included in the package.
Parent Group(s): PACKAGE , [SUB_REQUEST_STATUS_INFO]
ODL Type: Integer
Maximum Length: 10
Possible value(s): 1 to 2147483647

Keyword: NUMBER_OF_GRANULE_HITS
Synopsis: Number of granules from this data set included in query result set.
Parent Group(s): [DATASET]
Child Group(s):
ODL Type: Integer
Maximum Length: 10
Possible value(s): 1 to 2147483647

Keyword: NUMBER_OF_MEDIA_TYPE
Synopsis: Indicates how many media choices are available.
Parent Group(s): PROCESSING_OPTIONS
ODL Type: Integer
Maximum Length: 10
Possible value(s): 1 to 2147483647

Keyword: NUMBER_OF_MEDIA_FORMAT
Synopsis: Number of MEDIA_IDs in the following MEDIA_FORMAT group.
Parent Group(s): MEDIA_TYPE
ODL Type: Integer

Keyword: NUMBER_OF_OPTIONS
Synopsis: Indicates how many processing options are available.
Parent Group(s): PACKAGE
ODL Type: Integer
Maximum Length: 10
Possible value(s): 1 to 2147483647

Keyword: OPTION_ID
Synopsis: The valid value for selected processing options.
Parent Group(s): PROCESSING_OPTIONS
ODL Type: String

Keyword: ORGANIZATION
Synopsis: Additional address information, e.g., NASA.
Parent Group(s): CONTACT_ADDRESS, DAAC_CONTACT_ADDRESS, [BILLING_ADDRESS], [SHIPPING_ADDRESS]
ODL Type: String
Maximum Length: 60

Keyword: PACKAGE
Synopsis: The collection of granules or data which can be ordered from an archive.
Parent Group(s): INVENTORY_RESULT, DATASET
Child Group(s): DATA_CENTER_ID, DATASET_ID PACKAGE_ID, COMMENT, NUMBER_OF_GRANULES, NUMBER_OF_OPTIONS, PROCESSING_OPTIONS, [INFO_PROMPT], MEDIA_TYPE
ODL Type: String
Notes:

1. OPTION 1: for use when all package information is sent for the whole inventory result and is sent before the first DATASET group (disfavored and may not be implemented).
2. OPTION 2: for use when package information is sent in front of each relevant data set group.
3. OPTION 3: for use when package information is sent within each relevant data set group and before the granule group(s).

Keyword: PACKAGE_ID
Synopsis: Names of valid IMS distributed products. If the package information is the same for all granules in the data set and there is one product per granule, then use the character '*' for the PACKAGE_ID.
Parent Group(s): [GRANULE], PACKAGE, PRODUCT_DELIVERY
ODL Type: Sequence String
Maximum Length: 50

Keyword: PACKAGE_SIZE
Synopsis: The size of the package in bytes of data.
Parent Group(s): PROCESSING_OPTIONS
ODL Type: Integer
Maximum Length: 10
Possible value(s): 1 to 2147483647

Keyword: PARAMETER
Synopsis: Valid value that is a geophysical term associated with a data set or granule.
Parameters for product generation
Parent Group(s): [DATASET], [DIRECTORY_SEARCH], [GRANULE], [INVENTORY_SEARCH], PRODUCT_GENERATION
Child Group: PGR_CODE, PGR_VALUE
ODL Type: Aggregate (see note)

Notes:

1. PARAMETER is required in the DATASET or GRANULE groups of the INVENTORY_RESULT group.
2. PARAMETER can be given in the DATASET group if and only if the value of PARAMETER is the same for all the GRANULES in the DATASET group.
3. PARAMETER is used in two contexts
   - Under DATASET, DIRECTORY_SEARCH, GRANULE and INVENTORY_SEARCH group, the values is a geophysical term associated with a data set or granule.
   - Under PRODUCT_GENERATION group this is subgroup name.
4. ASTER GDS might not define values of "PARAMETER". So ASTER GDS Product Search by "PARAMETER" was eliminated.

Keyword: PHONE
Synopsis: Voice telephone number of associated person.
Parent Group(s): BILLING_ADDRESS, CONTACT_ADDRESS, SHIPPING_ADDRESS, DAAC_CONTACT_ADDRESS, DATA_SET_CONTACT
ODL Type: String
Maximum Length: 22
Possible value(s): any string

Keyword: POINT_LOC
Synopsis: Single point on the globe.
Parent Group(s): GRANULE, INVENTORY_SEARCH
Child Group(s): LATITUDE, LONGITUDE
ODL Type: Aggregate

Keyword: POLE_INCLUDED
Synopsis: Pole is included in described search area.
Parent Group(s): [POLYGON_LOC]
ODL Type: Symbol
Maximum Length: 1
Possible value(s): N,| S
Note: If not included in the location group then no pole included in region.

Keyword: POLYGON_LOC
Synopsis: Group of four latitude longitude pairs describing an area on the globe.
Parent Group(s): GRANULE, INVENTORY_SEARCH
Child Group(s) of GRANULE: LATITUDE, LONGITUDE, [POLE_INCLUDED], CENTROID_LAT, CENTROID_LON
Child Group(s) of INVENTORY_SEARCH: LATITUDE, LONGITUDE, [POLE_INCLUDED], MAP_PROJECTION_TYPE, TANGENT_LATITUDE, TANGENT_LONGITUDE
ODL Type: Aggregate

Keyword: PROCESSING_LEVEL
Synopsis: Level to which data has been processed.

Parent Group(s): [GRANULE] [DATASET], [INVENTORY_SEARCH]
ODL Type: Symbol
Maximum Length: 2
Possible value(s): 0, 1, 1a, 1b,| 2, 3, 4
Note: DATASET unique, currently under review

Keyword: PROCESSING_OPTIONS
Synopsis: User requested processing of GRANULE to produce a product.
Parent Group(s): PACKAGE
Child Group(s): OPTION_ID, PACKAGE_SIZE, NUMBER_OF_MEDIA_TYPE, MEDIA_TYPE
ODL Type: Sequence String
Maximum Length: 30

Keyword: PRODUCT_REQUEST
Synopsis: Provides data for product request.
Child Group(s): [BILLING_ADDRESS group], CONTACT_ADDRESS group, DATA_CENTER_ID, MESSAGE_ID, MEDIA group, MONITOR group, [SHIPPING_ADDRESS group], USER_AFFILIATION group, INITIATOR_REQUEST_ID, [AUTHENTICATOR], [ECS_AUTHENTICATOR], [INITIAL_USER_KEY], VERSION
ODL Type: Aggregate

Keyword: PRODUCT_RESULT
Synopsis: Group of information including Data Center contact information acknowledging a product request.
Child Group(s): DATA_CENTER_ID, MESSAGE_ID, MONITOR group, STATUS_CODE, [STATUS_CODE_COMMENT], DAAC_CONTACT_ADDRESS, VERSION
ODL Type: Aggregate

Keyword: PROTOCOL_VERSION
Synopsis: Version of message passing protocol, e.g., 3.5.
Parent Group(s): VERSION
ODL Type: Real

Keyword: QUIT
Synopsis: Termination message.
Child Group(s): MESSAGE_ID, [DATA_CENTER_ID], STATUS_CODE, [STATUS_CODE_COMMENT], [AUTHENTICATOR], [ECS_AUTHENTICATOR], MONITOR, VERSION
ODL Type: Aggregate

Keyword: RANGE_LOC
Synopsis: Group of maximum and minimum latitudes and longitudes describing an area.
Parent Group(s): DIRECTORY_SEARCH, GRANULE, INVENTORY_SEARCH

Child Group(s): EAST_LONGITUDE, NORTH_LATITUDE, SOUTH_LATITUDE, WEST_LONGITUDE
ODL Type: Aggregate

Keyword: RESTRICTION
Synopsis: Details of any ordering restrictions placed on the data set.
Parent Group(s): [DATASET group]
ODL Type: Sequence String
Maximum Length: 60
Possible value(s): any string

Keyword: RX_CLIENT
Synopsis: Time stamp when the client received the entire ODL message
Parent Group(s): [MONITOR group]
ODL Type: Sequence STRING
Maximum Length: 20
Possible value(s): two part: seconds (required), microseconds (optional)
Note: integer number of seconds as returned by the time () call or the gettimeofday call

Keyword: RX_SERVER
Synopsis: Time stamp when the server received the entire ODL message
Parent Group(s): MONITOR group
ODL Type: Sequence STRING
Maximum Length: 20
Possible value(s): two part: seconds (required), microseconds (optional)
Note: integer number of seconds as returned by the time () call or the gettimeofday call

Keyword: SENDER_VERSION
Synopsis: Descriptor identifying the name and number of the sender (client or server) that sent the message.
Parent Group(s): VERSION
ODL Type: String
Maximum Length: 16

Keyword: SENSOR_NAME
Synopsis: Name(s) of sensor.
Parent Group(s): [GRANULE], [DATASET], [DIRECTORY_SEARCH], [DIRECTORY_RESULT], [INVENTORY_SEARCH]
ODL Type: Sequence String
Maximum Length: 30

Keyword: SERVER_VERSION
Synopsis: Optional descriptor identifying the server version, and is stored in the group = VERSION.
Parent Group(s): VERSION

ODL Type: String
Maximum Length: 16

Keyword: SHIPPING_ADDRESS
Synopsis: Address where requested data is to be sent.
Parent Group(s): [PRODUCT_REQUEST]
Child Group(s): CITY, [EMAIL], [FAX], FIRST_NAME, [MIDDLE_INITIAL], LAST_NAME, PHONE, [STATE], COUNTRY, [ZIP], [TITLE], [ORGANIZATION], [ADDRESS]
ODL Type: Aggregate

Keyword: SOURCE_NAME
Synopsis: Name(s) of source/platform.
Parent Group(s): [GRANULE], [DIRECTORY_SEARCH], [DIRECTORY_RESULT], [INVENTORY_SEARCH], [DATASET]
ODL Type: Sequence String
Maximum Length: 30

Keyword: SOUTH_LATITUDE
Synopsis: Southern most latitude for an area on the globe
Parent Group(s): RANGE_LOC
ODL Type: Real
Maximum Length: 8
Possible value(s): -90.0000 to +90.0000

Keyword: START_DATE
Synopsis: Beginning of temporal interest
Parent Group(s): GRANULE, [DIRECTORY_SEARCH], [DIRECTORY_RESULT], [INVENTORY_SEARCH]
ODL Type: Date
Maximum Length: 20
Possible value(s): yyyy-mm-ddThh:mm:ss | yyyy-mm-ddThh:mm:ssZ

Keyword: START_DAY_OF_YEAR
Synopsis: Beginning day of seasonal interest
Parent Group(s): [INVENTORY_SEARCH]
ODL Type: Integer
Maximum Length: 3
Possible value(s): 1 TO 366

Keyword: STATE
Synopsis: US Postal state abbreviation for associated person
Parent Group(s): [BILLING_ADDRESS], [CONTACT_ADDRESS], [SHIPPING_ADDRESS], [DAAC_CONTACT_ADDRESS]
ODL Type: String

Maximum Length: 20
Possible value(s): any string

Keyword: STATUS_CODE
Synopsis: Numeric code giving status of query and/or server
Parent Group(s): DIRECTORY_RESULT, INTEGRATED_BROWSE_RESULT, INVENTORY_RESULT, PRODUCT_RESULT, QUIT, DATASET, PRODUCT_STATUS_INFO, PRICE_ESTIMATE_RESULT, PRODUCT_CANCEL_RESULT
ODL Type: Integer
Maximum Length: 4
Possible value(s): 1 to 20, or 1000
Notes:

01 successful query; query results returned
02 no match found
03 data for selected source are not archived at DAAC
04 data for selected sensor are not archived at DAAC
05 data set is not archived at DAAC
06 data for selected parameter(s) not archived at DAAC
07 data for selected source, sensor, parameter(s) and/or data set are not archived at DAAC
08 pertinent inventory system unavailable, try again later
09 bad message; message contains syntax error(s)
10 requested function not supported by this DAAC
11 system error, please try again later
12 search too broad, narrow spatial and/or temporal search criteria
13 no data for selected campaign archived at DAAC, please reconstruct Search Query
14 browse_granules_only selected, but no granules having browse data match
15 global_granules_only selected, but no granules having global coverage match
16 no data for requested processing level at this DAAC, please reconstruct Search Query
17 bad message; protocol error
18 system busy; try again later
19 system error; contact user support
20 data not found due to spatial and/or temporal limitation

103 ASTER GDS limitation on Product Request; all products can not be accepted
104 ASTER GDS limitation on Product Request; number of product request is over the limitation for processing level
105 ASTER GDS limitation on Product Request; number of product request is over the limitation for processing level by user type
106 ASTER GDS limitation on Product Request; number of product request is over the limitation for user type
107 ASTER GDS limitation on Product Request; number of product request is over the limitation for media type
109 ASTER GDS PG parameter error

1000 user-requested abort of search

Keyword: STATUS_CODE_COMMENT
Synopsis: Data Center provided commentary related to status code for communications.
Parent Group(s): [INVENTORY_RESULT], [DIRECTORY_RESULT],
[INTEGRATED_BROWSE_RESULT], [PRODUCT_RESULT], [QUIT],
[PRODUCT_STATUS_INFO], [PRICE_ESTIMATE_RESULT],
[PRODUCT_CANCEL_RESULT]
ODL Type: sequence string
Maximum Length: 128

Keyword: STOP_DATE
Synopsis: Date terminating interval of temporal interest.
Parent Group(s): GRANULE, [DIRECTORY_SEARCH], [DIRECTORY_RESULT],
[INVENTORY_SEARCH]
ODL Type: Date
Maximum Length: 20
Possible value(s): yyyy-mm-ddThh:mm:ss | yyyy-mm-ddThh:mm:ssZ

Keyword: STOP_DAY_OF_YEAR
Synopsis: Ending day of seasonal interest.
Parent Group(s): [INVENTORY_SEARCH]
ODL Type: Date
Maximum Length: 3
Possible value(s): 1 to 366

Keyword: TANGENT_LATITUDE
Synopsis: Current tangent (center) latitude of projection map.
Parent Group(s): POLYGON_LOC
ODL Type: Real
Maximum Length: 8
Possible value(s): -90.0000 to +90.0000

Keyword: TANGENT_LONGITUDE
Synopsis: Current tangent (center) latitude of projection map.
Parent Group(s): POLYGON_LOC
ODL Type: Real
Maximum Length: 9
Possible value(s): -180.0000 to +180.0000

Keyword: TITLE
Synopsis: Part of the User Profile. A user's formal designation.
Parent Group(s): [CONTACT_ADDRESS], [SHIPPING_ADDRESS], [BILLING_ADDRESS]
ODL Type: String
Maximum Length: 5

Keyword: TX_CLIENT
Synopsis: Time stamp when client transmitted entire ODL message.
Parent Group(s): MONITOR group
ODL Type: Sequence STRING
Maximum Length: 20
Possible value(s): two part: seconds (required), microseconds (optional)
Note: integer number of seconds as returned by the time () call or the gettimeofday call

Keyword: TX_SERVER
Synopsis: Time stamp when server transmitted entire ODL message.
Parent Group(s): MONITOR group
ODL Type: Sequence STRING
Maximum Length: 20
Possible value(s): two part: seconds (required), microseconds (optional)
Note: integer number of seconds as returned by the time () call or the gettimeofday call

Keyword: TYPE
Synopsis: Affiliation categories: Government, Commercial, Academic, Other.
Parent Group(s): USER_AFFILIATION
ODL Type: String
Maximum Length: 15
Note: ASTER GDS definition might not fit into the above definition.

Keyword: TYPE_ID
Synopsis: The valid values for selected media types.
Parent Group(s): MEDIA_TYPE
ODL Type: String
Maximum Length: 30

Keyword: UNMAPPED_FIELD
Synopsis: Field(s) given in query not used in inventory search.
Parent Group(s): [INVENTORY_RESULT]
ODL Type: Sequence String
Maximum Length:
Possible value(s): any keyword contained in the INVENTORY_SEARCH group

Keyword: USER_AFFILIATION
Synopsis: General information for user services statistics.
Parent Group(s): PRODUCT_REQUEST, BROWSE_REQUEST
Child Group(s): CATEGORY, TYPE
ODL Type: Aggregate

Keyword: VALID_ACCOUNTS
Synopsis: Contains DAAC provided valid account information associated with a particular data set. Is an optional or a repeating group.

Parent Group(s): [DATASET]
Child Group(s): ACCOUNT_NUMBER, [BALANCE], [ERROR]
ODL Type: Group
Notes:

1. There may be 0 valid account groups sent in inventory/data set group.
2. If the user has no valid account, then 1 valid account group will be sent containing only the error object with information to instruct or inform the user.
3. For cases with multiple accounts, many valid accounts groups will be sent, each containing mandatory account number with optional balance and error fields.
4. ASTER GDS does not return this keyword.

Keyword: VERSION
Synopsis: Information identifying the client and server version
Parent group(s): Used in all message types
ODL Type: Aggregate
Maximum Length: N/A

Keyword: WEST_LONGITUDE
Synopsis: Western most longitude for an area on the globe.
Parent Group(s): RANGE_LOC
ODL Type: Real
Maximum Length: 9
Possible value(s): -180.0000 to +180.0000

Keyword: XHAIRS
Synopsis: TBD
Parent group(s): INVENTORY_SEARCH
Child Group: LATITUDE, LONGITUDE, LATITUDE_DISTANCE, LONGITUDE_DISTANCE
ODL Type: TBD
Maximum Length: TBS

Keyword: ZIP
Synopsis: US Postal ZIP code for associated person.
Parent Group(s): [BILLING_ADDRESS], [CONTACT_ADDRESS], [SHIPPING_ADDRESS], [DAAC_CONTACT_ADDRESS]
ODL Type: String
Maximum Length: 15
Possible value(s): any string

B.2 ODL Message Keywords for Required Extensions

This section identifies and defines the ODL Message Keywords which are ASTER GDS extensions to the V0 ODL specificiation.

Keyword: CLOUD_COVERAGE
Synopsis: Percent of cloud coverage for granule
Parents Group: [INVENTORY_SEARCH]
Child Group: Not Used
ODL Type: Integer
Note: This keyword is used as user's search parameter. This value is for quadrant scene.

Keyword: COMPLETION_DATE
Synopsis: Actual date that Product Request is completed.
Parent Group: [ORDER_STATUS_INFO], [SUB_REQUEST_STATUS_INFO]
Child Group: Not Used
ODL Type: String
Maximum Length: 10
Possible Value(s): yyyy-mm-dd
Note: In the case that STATUS_CODE is "COMPLETED", STATUS_INFO group incorporates this keyword.
ASTER GDS does not return COMPLETION_DATE under SUB_REQUEST_STATUS_INFO.

Keyword: DATA_CENTER_LONGNAME
Synopsis: TBD
Parent Group(s): DATA_SET_CONTACT
ODL Type: String
Maximum Length: TBD

Keyword: DATA_CENTER_URL
Synopsis: The Universal Reference Locator for accessing the data center.
Parent Group(s): [DATA_SET_CONTACT]
ODL Type: String
Maximum Length: 64

Keyword: DATA_SET_CONTACT
Synopsis: Iinformation for contacting data center for a particular data set.
Parent Group(s): [DIRECTORY_RESULT]
Child Group(s): DATA_CENTER_LONGNAME, [DATA_CENTER_URL], [FIRST_NAME], [MIDDLE_INITIAL], [LAST_NAME], PHONE, [FAX], EMAIL, ADDRESS
ODL Type: Aggregate

Keyword: DATASET_SUMMARY
Synopsis: TBD
Parent Group(s): DATASET group for DIRECTORY_RESULT
ODL Type: TBD
Maximum Length: TBD
Comment: See "Keyword: DATASET".

Keyword: DISCIPLINE
Synopsis: TBD
Parent Group(s): DATASET group for DIRECTORY_RESULT
ODL Type: String
Maximum Length: TBD

Keyword: EASTBOUNDINGCOORDINATE
Synopsis: TBD
Parent Group(s): SPATIAL_COVERAGE
ODL Type: Float
Maximum Length: TBD

Keyword: ESTIMATED_PRICE
Synopsis: Estimated total price of products
Parent Group: PRICE_ESTIMATE_RESULT
Child Group: Not Used
ODL Type: Real
Maximum Length:
Note: The unit is Yen.
Proposal: ASTER GDS think that ODL Type had better be changed from Real to Integer. Maximum Length is about 10.

Keywords: INITIATOR_REQUEST_ID
Synopsis: ID assigned by the ASTER Gateway or ASTER GDS IMS to track Product Request.
Parent Group: PRODUCT_REQUEST, PRODUCT_STATUS_REQUEST, ORDER_STATUS_INFO, PRODUCT_CANCEL_REQUEST, PRODUCT_CANCEL_RESULT
Child Group: Not Used
ODL Type: String
Maximum Length: 30
Note:

1. When ECS client submits Product Request, ASTER Gateway generates this ID.
2. When ASTER GDS client submits Product Request, ASTER GDS IMS generates this ID.

Keyword: MAXIMUM_ALTITUDE
Synopsis: TBD
Parent Group(s): SPATIAL_COVERAGE
ODL Type: TBD
Maximum Length: TBD

Keyword: MAXIMUM_DEPTH
Synopsis: TBD
Parent Group(s): SPATIAL_COVERAGE
ODL Type: TBD
Maximum Length: TBD

Keyword: MEDIA
Synopsis: Media information for Product Request.
Parent Group: PRICE_ESTIMATE_REQUEST, PRODUCT_REQUEST
Child Group: MEDIA_TYPE, MEDIA_FORMAT, PRODUCT_DELIVERY
ODL Type: Aggregate

Keyword: MINIMUM_ALTITUDE
Synopsis: TBD
Parent Group(s): SPATIAL_COVERAGE
ODL Type: TBD
Maximum Length: TBD

Keyword: MINIMUM_DEPTH
Synopsis: TBD
Parent Group(s): SPATIAL_COVERAGE
ODL Type: TBD
Maximum Length: TBD

Keyword: NORTHBOUNDINGCOORDINATE
Synopsis: TBD
Parent Group(s): SPATIAL_COVERAGE
ODL Type: TBD
Maximum Length: TBD

Keyword: ORDER_STATUS_CODE
Synopsis: Provides the status for a order status request.
Parent Group: [PRODUCT_CANCEL_RESULT], ORDER_STATUS_INFO
Child Group: Not used
ODL Type: String
Possible Value(s): PROPOSED|ACCEPTED|PROCESSING|CANCELED| FAILED
Maximum Length: 10
Note:

1. "PROPOSED"means that Product Request is received by ASTER GDS IMS.
2. "ACCEPTED" means that Product Request is received by ASTER GDS DADS.
3. "PROCESSING" means that Product Request is processed for delivery.
4. "CANCELED"means that all Product Requests added one INITIATOR_REQUEST_ID is canceled because of user's cancel request.
5. "FAILED" means request could not be processed because of an error condition

Keyword: ORDER_STATUS_INFO
Synopsis: TBD
Parent Group(s): PRODUCT_STATUS_INFO
Child group(s): INITIATOR_REQUEST_ID, RECEIVE_DATE,
PLANNED_COMPLETION_DATE, [COMPLETION_DATE], PRICE,

ORDER_STATUS_CODE, [ORDER_STATUS_COMMENT], SHIPPING_ADDRESS, SUB_REQUEST_STATUS_INFO
ODL Type: Aggregate

Keyword: ORDER_STATUS_COMMENT
Synopsis: Ancillary information concerning an order cancellation request.
Parent Group: [PRODUCT_CANCEL_RESULT], [ORDER_STATUS_INFO]
Child Group: Not used
ODL Type: String
Maximum Length: 128

Keyword: PGR_CODE
Synopsis: TBD
Parent Group(s): PARAMETER
ODL Type: String
Maximum Length: 16
Note: The possible value of keywords in "PARAMETER group" is defined by Valids.

Keyword: PGR_VALUE
Synopsis: TBD
Parent Group(s): PARAMETER
ODL Type: TBD
Maximum Length: TBD
Note: The possible value of keywords in "PARAMETER group" is defined by Valids.

Keyword: PREDICTED_COMPLETION_DATE
Synopsis: Estimated number of days until product is ready for delivery
Parent Group(s): PRICE_ESTIMATE_RESULT Group
ODL Type: Integer
Possible values: 0 to 65335

Keyword: PRICE
Synopsis: Estimated total price of products
Parent Group: ORDER_STATUS_INFO
Child Group: Not Used
ODL Type: Real
Maximum Length:
Note: The unit is Yen.

Keyword: PRICE_COMMENT
Synopsis: Provide the information for price calculation (algorithm, etc.).
Parent Group: [PRICE_ESTIMATE_RESULT]
Child Group: Not Used
ODL Type: Sequence String

Maximum Length: 128
Possible value(s): any string

Keyword: PRICE_ESTIMATE_REQUEST
Synopsis: Provide the information for estimated total price of products that user orders.
Parent Group: Not Used
Child Group: MEDIA, MONITOR, VERSION, MESSAGE_ID, DATA_CENTER_ID,
ODL Type: Aggregate
Note: This request is submitted prior to Product Request.

Keyword: PRICE_ESTIMATE_RESULT
Synopsis: Provide estimated total price of products that user orders.
Parent Group: Not Used
Child Group: MONITOR, MESSAGE_ID, DATA_CENTER_ID, STATUS_CODE, [STATUS_CODE_COMMENT], ESTIMATED_PRICE, [PRICE_COMMENT], PREDICTED_COMPLETION_DATE, VERSION
ODL Type: Aggregate

Keyword: PROCESSING_DATA_CENTER
Synopsis: Data Center which is handling a processing request
Parent Group(s): SUB_REQUEST_STATUS_INFO
Child group(s): None
ODL Type: String
Note: This is returned from ECS only.

Keyword: PRODUCT_DELIVERY
Synopsis: Delivered product and generated product
Parent Group: MEDIA
Child Group: [PRODUCT_GENERATION], DATASET_ID, PACKAGE_ID, SENSOR_TYPE
ODL Type: Aggregate
Note:

1. When user requests delivery of product only, "DATASET_ID" and "PACKAGE_ID" incorporated in PRODUCT_DELIVERY group mean delivered product. In this case, PRODUCT_DELIVERY group doesn't incorporate PRODUCT_GENERATION group.
2. When user requests generation and delivery of product, "DATASET_ID" and "PACKAGE_ID" incorporated in PRODUCT_DELIVERY group mean source product for generation. In this case, PRODUCT_DELIVERY group incorporates PRODUCT_GENERATION group.

Keyword: PRODUCT_GENERATION
Synopsis: Processing level and parameter for product generation.
Parent Group: [PRODUCT_DELIVERY]
Child Group: PARAMETER, PRODUCT_TYPE
ODL Type: Aggregate

Keyword: PRODUCT_STATUS_INFO
Synopsis: Provide processing status of product request after user submits.
Parent Group: Not Used
Child Group: MONITOR, MESSAGE_ID, DATA_CENTER_ID, STATUS_CODE, [STATUS_CODE_COMMENT], ORDER_STATUS_INFO, VERSION
ODL Type: Aggregate
Note: This group incorporates processing status of all granule in some product requests.

Keyword: PRODUCT_STATUS_REQUEST
Synopsis: Provide information for obtaining processing status of product request after user submits.
Parent Group: Not Used
Child Group: MONITOR, VERSION, MESSAGE_ID, INITIATOR_REQUEST_ID
ODL Type: Aggregate
Note: This request must incorporate INITIATOR_REQUEST_ID keyword.

Keyword: PRODUCT_TYPE
Synopsis: Type of product in the case of product generation.
Parent Group: PRODUCT_GENERATION
Child Group: Not Used
ODL Type: Symbol
Maximum Length: 10
Possible Value(s): 1B00 | 2A02 | 2A03
Note: "1B00" means product level 1B. "2A02" and "2A03" means decorrelation stretch. Possible values will be added in the future.

Keyword: PLANNED_COMPLETION_DATE
Synopsis: Planed date that Product Request is completed (after scheduled).
Parent Group: ORDER_STATUS_INFO
Child Group: Not Used
ODL Type: String
Maximum Length: 10
Possible Value(s): yyyy-mm-dd

Keyword: PRODUCT_CANCEL_REQUEST
Synopsis: Provide the information for cancel of Product Request.
Parent Group: Not Used
Child Group: MESSAGE_ID, INITIATOR_REQUEST_ID, [SUB_REQUEST_ID], MONITOR, VERSION
ODL Type: Aggregate

Keyword: PRODUCT_CANCEL_RESULT
Synopsis: Provide the response for cancel request of Product Request.
Parent Group: Not Used

Child Group: MESSAGE_ID, DATA_CENTER_ID, STATUS_CODE, [STATUS_CODE_COMMENT], INITIATOR_REQUEST_ID, [ORDER_STATUS_CODE], [ORDER_STATUS_COMMENT], [SUB_REQUEST_INFO], MONITOR, VERSION
ODL Type: Aggregate
Note: In the case of ASTER GDS, this group means the reception for Product Cancel Request. From this group, ECS client can not know if Product Request is canceled. From Product Status Information, ECS client can know if Product Request is canceled.
ASTER GDS understands that ECS returns the PRODUCT_CANCEL_RESULT that includes each success/fail and comment for requests attempted to be canceled.

Keyword: QUADRANT_CLOUD_COVERAGE (for ASTER GDS only)
Synopsis: Percent of cloud coverage for quadrant scene.
Parents Group: [GRANULE]
Child Group: Not Used
ODL Type: Sequence Integer
Note: This keyword means the cloud coverage percentages for 4 quarters of a scene in the order of : upper left -> upper right -> lower left -> lower right

Keyword: RECEIVE_DATE
Synopsis: TBD
Parent Group(s): ORDER_STATUS_INFO
Child group(s): Not used
ODL Type: Date
Maximum Length: 20
Possible value(s): yyyy-mm-ddThh:mm:ss | yyyy-mm-ddThh:mm:ssZ

ODL Keyword: REQUEST_STATUS_CODE
Synopsis: Provides the cancellation status for a sub-request associated with an order request.
Parent Group: SUB_REQUEST_STATUS_INFO, [SUB_REQUEST_INFO]
Child Group: Not used
ODL Type: String
Possible Values: PROPOSED|ACCEPTED|PROCESSING|CANCEL| FAILED
Comment: The definition of value provided by ASTER SDPS is shown as follows.
1. "PROPOSED" means that Product Request is received by ASTER GDS IMS.
2. "ACCEPTED" means that Product Request is received by ASTER GDS DADS.
3. "PROCESSING" means that Product Request is processed for delivery.
4. "CANCELED" means that Product Requests is canceled because of user's cancel request.
5. "FAILED" means that Product Request including generation parameter is failed during "PROCESSING" because of generation parameter error.

Maximum Length: 10

Keyword: REQUEST_STATUS_COMMENT
Synopsis: Ancillary information concerning a request for cancellation of a sub-request.
Parent Group: [SUB_REQUEST_STATUS_INFO], [SUB_REQUEST_INFO]
Child Group: Not used

ODL Type: String
Maximum Length: 128

Keyword: SCENE_CLOUD_COVERAGE (for ASTER GDS only)
Synopsis: Average percent of cloud coverage for scene.
Parents Group: [GRANULE]
Child Group: Not Used
ODL Type: Integer
Note: This value is for the whole scene

Keyword: SENSOR_TYPE.
Synopsis: TBD
Parent Group(s): PRODUCT_DELIVERY
Child group(s): not used
ODL Type: Sequence String
Possible Value(s): "VST", "V ", " S ", " T", "VS ", " ST", "V T"
Note: The possible value of "SENSOR_TYPE" for delivery product type is defined by Valids.

Keyword: SOUTHBOUNDINGCOORDINATE
Synopsis: TBD
Parent Group(s): SPATIAL_COVERAGE
ODL Type: TBD
Maximum Length: TBD

Keyword: SPATIAL_COVERAGE
Synopsis: TBD
Parent Group(s): DATASET group for DIRECTORY_RESULT
Child Group(s): EASTBOUNDINGCOORDINATE, [MAXIMUM_ALTITUDE], [MAXIMUM_DEPTH], [MINIMUM_ALTITUDE], [MINIMUM_DEPTH], NORTHBOUNDINGCOORDINATE, SOUTHBOUNDINGCOORDINATE, WESTBOUNDINGCOORDINATE
ODL Type: Aggregate.

Keyword: SUB_REQUEST_ID
Synopsis: TBD
Parent Group: SUB_REQUEST_STATUS_INFO, SUB_REQUEST_INFO
Child Group: None
OLD Type: TBD
Comment: Integer

Keyword: SUB_REQUEST _INFO
Synopsis: TBD
Parent Group: [PRODUCT_CANCEL_RESULT]
Child Group: SUB_REQUEST_ID, [REQUEST_STATUS_CODE], [REQUEST_STATUS_COMMENT]

OLD Type: Aggregate

Keyword: SUB_REQUEST_STATUS_INFO
Synopsis: TBD
Parent Group: ORDER_STATUS_INFO
Child Group: SUB_REQUEST_ID, REQUEST_STATUS_CODE,
[REQUEST_STATUS_COMMENT], [COMPLETION_DATE],
[PROCESSING_DATA_CENTER], MEDIA_TYPE, MEDIA_FORMAT,
DATASET_ID, [NUMBER_OF_GRANULES]
OLD Type: Aggregate

Keyword: TERM
Synopsis: TBD
Parent Group(s): DATASET group for DIRECTORY_RESULT
ODL Type: TBD
Maximum Length: TBD

Keyword: TOPIC
Synopsis: TBD
Parent Group(s): DATASET group for DIRECTORY_RESULT
ODL Type: TBD
Maximum Length: TBD

Keyword: VARIABLE
Synopsis: TBD
Parent Group(s): DATASET group for DIRECTORY_RESULT
ODL Type: TBD
Maximum Length: TBD

Keyword: WESTBOUNDINGCOORDINATE
Synopsis: TBD
Parent Group(s): SPATIAL_COVERAGE
ODL Type: TBD
Maximum Length: TBD

Keyword: XAR_ID (for ASTER GDS only)
Synopsis: ID for xAR that produced the granule.
Parents Group: [INVENTORY_SEARCH], [GRANULE]
Child Group: Not Used
ODL Type: Sequence Integer
Maximum Length: 4

B.3 Server State Table

This table shows transfer of processing in server when server receives each request. Italic and bold characters mean processing regarding extension.

Table B-1. Server States

State and action taken	Event (returned by action)	New State
Accept	Got Inventory Search	Query for Granules
	Got Directory Search (only ECS)	TBS (only ECS)
	Got Int. Browse Request	Process Int. Browse Request
	Got Price Estimate Request	Process Price Estimate Request
	Got Product Request	Process Product Request
	Got Product Status Request	Process Product Status Request
	Got Product Cancel Request	Process Product Cancel Request
	Got No Data	Accept
	Got ABORT	Stop
	Got QUIT	STOP
	Server Crash	Stop
	Server System Error	Stop
	Errors(returned from ECS)	Tx QUIT [status code: 17, 18]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 9, 17, 18]
Query for Granules	Query Success	Build First Chunk
	Errors(returned from ECS)	Tx QUIT [status code: 2-16, 19, 20]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 2, 7, 9, 11, 16]
action: Query Inventory		
Build First Chunk	Fetch Granule Success	Tx Inventory Result Chunk
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Fetch Granule		
Build Next Inv. Result Chunk	Fetch Granule Success	Tx Inventory Result Chunk
	Fetch Granule Complete	Tx QUIT [status code: 1]
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Check Status of Last Fetch		
Tx Inventory Result Chunk	Client Down	Close
	Server Crash	Stop
	Send Granules Success	Listen Search ACK
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Send Granule to Client and Fetch Next Chunk		
Listen Search ACK	Got Search Result ACK	Build Next Inv. Result Chunk
	Got QUIT	Close
	Got ABORT	Close
	Errors	Tx QUIT [status code: 17]
action: Listen Search ACK		
Query for MD Entries (TBS only ECS)	Query Success	Tx MD Result
	Errors	Tx QUIT [status code: 2-11, 13, 19, 20]
action: Query Directory		
Tx MD Result (TBS only ECS)	Send Success	Close
	Client Down	Close
	Server Crash	Stop
	Errors	Tx QUIT [status code: 11, 19]

Table B-1. Server States (2 of 3)

State and action taken	Event (returned by action)	New State
Process Int. Browse Request	Process Success	Build Integrated Browse ODL
	Errors	Tx QUIT [status code: 2, 8-11, 19]
action: Get Image		
Build Integrated Browse ODL	Build Success	Tx Integrated Browse ODL
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 2, 9, 11]
action: Build Int. Browse ODL		
Tx Integrated Browse ODL	Send Success	Tx Integrated Browse Image
	Server Crash	Stop
	Client Down	Close
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Send Int. Browse ODL to Client		
Tx Integrated Browse Image	Send Success	Tx Integrated Browse image
	Send Complete	Close
	Server Crash	Stop
	Client Down	Close
	Got ABORT	Close
	Got QUIT	Close
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Send Int. Browse Image to Client		
Process Price Estimate Request	Process Success	Tx Price Estimate Result
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 9, 11]
action: Process Price Estimate Request		
Tx Price Estimate Result	Send Success	Close
	Client Down	Close
	Server Crash	Stop
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Send Price Estimate Result to Client		
Process Product Request	Process Success	Tx Product Request Contact Info
	Errors(returned from ECS)	Tx QUIT [status code: 9-11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11, 103-107, 109]
action: Process Product Request		
Tx Product Request Contact Info	Send Success	Close
	Client Down	Close
	Server Crash	Stop
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Send Product Request to Client		

Table B-1. Server States (3 of 3)

State and action taken	Event (returned by action)	New State
Process Product Status Request	Process Success	Tx Product Status Info
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 2, 9, 11]
action: Process Product Status Request		
Tx Product Status Info	Send Success	Close
	Client Down	Close
	Server Crash	Stop
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Send Product Status Info to Client		
Process Product Cancel Request	Process Success	Tx Product Cancel Results
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 2, 9, 11]
action: Process Product Cancel Request		
Tx Product Cancel Results	Send Success	Close
	Client Down	Close
	Server	Stop
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Send Product Cancel Results to Client		
Tx QUIT[]	Send Success	Close
	Server Crash	Stop
	Client Down	Close
	Errors(returned from ECS)	Tx QUIT [status code: 11, 19]
	Errors(returned from ASTER GDS)	Tx QUIT [status code: 11]
action: Send QUIT with Status Code to Client		
Close	Done	Stop
action: Close Communication		

Appendix C. DAR Client API List

ASTER-GDS IMS
DAR Client API LIST
Final

October 1996

Mitsubishi Electric Co., Ltd.

Change History

change#	change notes	date
01	•reflect Feb. NASA I/F meeting - DAR API support DAR gateway function •reflect xAR DB parameter	3/15/96
02	•delete checkDAR API function •reflect review result of API argument •reflect revised xAR DB	4/15/96
03	•reflect revised xAR DB •change requester ID type to char •add modifyDar API function	6/4/96
03'	•change table-2,4,6 to include all input parameters.	6/7/96
04	•delete CancelDar function. •add modify stream.	7/8/96
05 final DRAFT	•modify expression •add error code to each API function •add default value and range in the table •reflect the latest(Sep 03, 1996) science requirement	9/24/96
06 final	•add AOI placement in table-3 •add cloud cover per quadrant in table-4 •add scene placement in table-4 •delete Comments for Urgency in table-1 •change data type u_int to int •change data type u_char to char	10/09/96

1. PREMISE

DAR server API provids the functionality to transmit data concerning DAR between DAR gateway and DAR server. The location of DAR server API is shown Fig-1. This document is described for the explanation of API usage and calling format.

(1)API prepared by ERSDAC is a C language program library for supporting DARÊgateway functions.
(2)DAR server API provides socket interface.
(3)API contents and data tables depend on xAR DB structure.

1.1 Request for DAR client

ASTER-GDS IMS DAR server performs data stream contents check. However,DAR client S/W should be checked user input parameter due to be less response time between ECS and ASTER-GDS.
The following items shows

- User privilege check
 ¥ Checking user by requester ID if user can access DAR server or not.

- Data contents check
 Contents check at DAR registration and search request.
 ¥ If mandatory items are setting or not.
 ¥ Error check of designation for observation repetition request.

- Input range check.
 DAR individual item check.
 ¥ Maximum/Minimum Look angle
 ¥ Sun angle
 ¥ Latitude and longitude of AOI polygon
 ¥ Lifetime Start/End and another observation timing parameters

1.2 API functionality

¥ submitDar : DAR registration request
¥ modifyDar : DAR modification
¥ getxARStatus : xAR status request
¥ getSubxARStatus : Sub-xAR and scene status request
¥ getxARcontents : xAR contents request
¥ getSchedule : Schedule information request

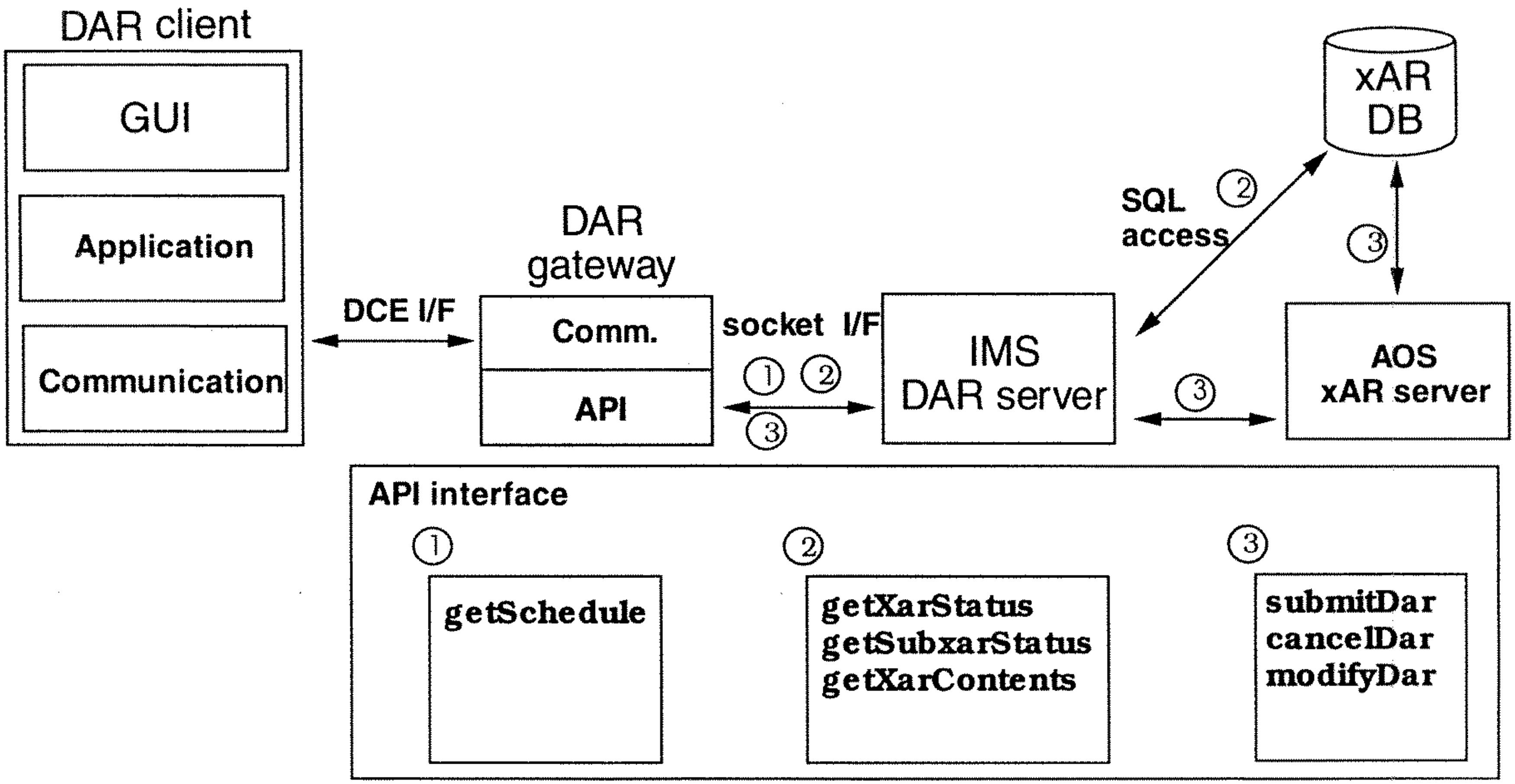

Fig-1 DAR server API

DAR API input & output

API name	input	output
submitDar	•DAR input parameter	•xAR ID
getxARStatus	•Search condition	•xAR Status search result
getSubxARStatus	•Search condition	•SubxAr Status search result
getxARContents	•xAR ID	•xAR contents
getSchedule	•resource name •request day	•schedule information
modifyDar	•Modify parameter	•NONE

2.API functionality and calling format

Name : int submitDar(*xarDataStream, *DarID)

Function :Sending DAR registration request from DAR client to DAR server.After DAR server checked DAR contents valid data,sending DAR data to xAR server of AOS. When AOS regists requested DAR as new xAR, xAR server return its xAR ID to DAR server. This function allows to use for the privilede user. DAR client should need to check user ID.

Argument :***char *xarDataStream (in)***
DAR contents data stream setting by requester.Polygon information data length is a variable length record. (cf.Table-1, Figure-1)

u_int *DarID (out)
responded xAR ID from DAR server

Return code : 0 - no error
11 - Communication error on IMS DAR server connection
12 - Communication error on IMS DAR server response
13 - Communication error on AOS xAR server connection
14 - Communication error on AOS xAR server response
31 - AOS xAR server error return : format error
32 - AOS xAR server error return : limit error
33 - AOS xAR server error return : syntax error
41 - Data stream format error
42 - xAR services stopped
50 - user cannot submit DAR

Name : int getxARStatus(*searchStream, *resultStream)

```
Function     :getting xAR status by matching with searchStream.
             This function apply to search xAR(DAR,ETR and STAR)
             status from xAR DB.
```

Argument :***char *searchStream (in)***

```
                          Data stream stored search condition.
                                     (cf.Table-2, Figure-2)
```

char *resultStream (out)

```
                          Data stream stored xAR status as
                     result of search.
                                       (cf.Table-3, Figure-3)
Return code : 0 - no error
               11 - Communication error on IMS DAR server connection
               12 - Communication error on IMS DAR server response
               21 - xAR DB access error on connection
               22 - xAR DB access error on response
               23 - xAR search error : no data found
               24 - xAR search error : too much data
               41 - Data stream format error
               42 - xAR services stopped
```

Name : int getSubxARStatus(*searchSubxarStream, *subxarStream)

Function :getting SubxAR and scene status from xAR DB by coincidence with searchSubxarStream. SubxAR is generated by xAR observation repetition. Scene represents unit of observation.

Argument :***char *searchSubxarStream (in)***
Data stream stored search subxAR condition. (cf.Table-6)

char *subxarStream (out)
Data stream stored subxAR and scene status (cf.Table-4, Figure-4)

Return code : 0 - no error
11 - Communication error on IMS DAR server connection
12 - Communication error on IMS DAR server response
21 - xAR DB access error on connection
22 - xAR DB access error on response
23 - xAR search error : no data found
24 - xAR search error : too much data
41 - Data stream format error
42 - xAR services stopped

```
Name  : int getxARContents( xarID, *xarDataStream )
Function    :getting a xAR contents from xAR DB by matching xAR ID.
             This function respons one xAR contents for one request.

Argument    :u_int xarID (in)
                      Registered xAR ID to get contents
             char *xarDataStream (out)
                            Data stream stored one xAR contents
                                                (cf. Table-1, Figure-1)

Return code : 0 - no error
                   11 - Communication error on IMS DAR server connection
                   12 - Communication error on IMS DAR server response
                   21 - xAR DB access error on connection
                   22 - xAR DB access error on response
                   23 - xAR search error : no data found
                   24 - xAR search error : too much data
                   41 - Data stream format error
                   42 - xAR services stopped
```

```
Name   : int getSchedule(*day, *scheduleStream )

Function    :getting converted xAR schedule(LTS,STS,ODS) dataÊfor .
            24 hours from request day.

Argument    :char *day (in) 19bytes
                          Request day of schedule
                                "YYYY/MM/DD hh:mm:ss"
             char *scheduleStream (out)
                                      Data stream stored schedule data
                                                  (cf. Table-5, Figure-5)

Return code : 0 - no error
                 11 - Communication error on IMS DAR server connection
                 12 - Communication error on IMS DAR server response
                 25 - shedule not found
                 41 - Data stream format error
                 42 - xAR services stopped
```

Name : int modifyDar(*modifyStream)

Function :Sending DAR modification request.This functionÊallow to use for the privilege user. DAR client S/W should check user ID.
This function apply registered DAR only.

Argument :***char *modifyStream (in)***
Data stream stored DAR modify condition.
(cf. Table-7)

Return code : 0 - no error
11 - Communication error on IMS DAR server connection
12 - Communication error on IMS DAR server response
13 - Communication error on AOS xAR server connection
14 - Communication error on AOS xAR server response
31 - AOS xAR server error return : format error
32 - AOS xAR server error return : limit error
33 - AOS xAR server error return : syntax error
41 - Data stream format error
42 - xAR services stopped
50 - user cannot submit DAR

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Appendix D. ASTER Level 1 Data Products Specification (GDS Version)

ASTER LEVEL 1 DATA PRODUCTS SPECIFICATION (GDS Version)

Version ß

October 18, 1996

ERSDAC

Earth Remote Sensing Data Analysis Center

PREFACE

This Specification defines Level-1A and 1B Data Products (GDS version), which are output from the software of ASTER Level-1 Data Processing Sybsystem (Version b).

Table of Contents

1. Level 1 Overview

1.1. Applicable Standards

This section identifies documents that directly apply in defining this interface specification, and those reference documents that indirectly apply to obtain background information related.

1.1.1. Applicable Documents

The following documents apply to this Specification in whole, unless cited otherwise herein.

1. ERSDAC-LEL/7-13	Algorism Theoretical Basis Document for ASTER Level-1 Data Processing (Ver.2.1), prepared by Level-1 Data Working Group, ASTER Science Team, Japan, December 26, 1995
2. ERSDAC-LEL/7-12	Algorism Development Specification : ASTER Level-1 Data Processing (for Ver.1.1), March 15, 1996 (in Japanese)
3. ERSDAC-LEL/7-11	ASTER Level 1 Data Products Specification (Science Version, Ver.1.1), March 15, 1996
4. ERSDAC-LEL/7-09	Interface Specification : ASTER Level-1 Data Processing (for Ver.1), August 28, 1995 (in Japanese)
5. AG-S-E-0409-R03	ASTER GDS Core Meta Data Specification (Version 1.0 Draft), July 3, 1996

1.1.2. Reference Documents

The following documents are used as background reference documents related to this Specification.

1. 510-ICD-EDOS	Interface Control Document between EDOS and ASTER GDS, CDRL B311, Draft Ver.3, July 1995
2. CCSDS 641.0-B-1	Parameter Value Language Specification (CCSD006), Blue Book, May 1992
3. ERSDAC-LEL/7-5	Interface Specification : ASTER Level-1 Data Processing (for Ver.a, Ver.b), 1994 (in Japanese)
4. HDF User's Guide Version 4.0	the National Center for Supercomputing Applications at University of Illinois at Urbana-Champaign., March 1996
5. HDF-EOS User's Guide for the ECS Project Revision 1 (Draft)	EOSDIS Core System Project, April 1996
6. WBS-WP-xxx-yyy	The HDF-EOS Swath Concept, June 30, 1995
7. 170-WP-002-001	The HDF-EOS Grid Concept, February 1996
8. 333-CD-003-004	Release A SCF Toolkit Users Guide for the ECS Project, May 1996
9. 311-CD-002-005	Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project, May 1996
10. ERSDAC-LEL/8-7	ASTER Level 1 Data Products Specification (Science Version, Ver.2.0), September 5, 1996 (This document partialy apply to this Specification.)

2. Level 1A Data Product

2.1 Overview

Level 1A Data Product is an HDF file. Each file contains a complete 1-scene image data extracted from Level-0 data and corrected for the SWIR and TIR detector's alignment.
Furthermore it includes also the radiometric, the geometric and the SWIR parallax correction tables, spacecraft's supplement data, the satellite ancillary data, the calculated cloud coverage values, and Browse images (see NOTE).
All of these data are stored together with Metadata, Raster, Vgroup/Vdata, and Swath Layout parts in one HDF file.

(NOTE) As Browse images are divided from Level 1A Data Product in "ASTER Level 1 Data Product Specification (science version, version 2.0)", these will be stored in another HDF file as a subset of Level 1A data products in next version.

2.2 Data Structure

(1) Data Type
Level 1A Data Product within HDF file is constructed form eleven categories of HDF data object.
NOTE: VNIR (4 bands) and SWIR (6 bands) image data are 8-bit unsigned integer science data, and TIR (5 bands) image data are 16-bit unsigned integer science data in each Swath object.

(2) Data Structure
The physical data of Level 1A Data Product is shown in Figure 2.2-1.

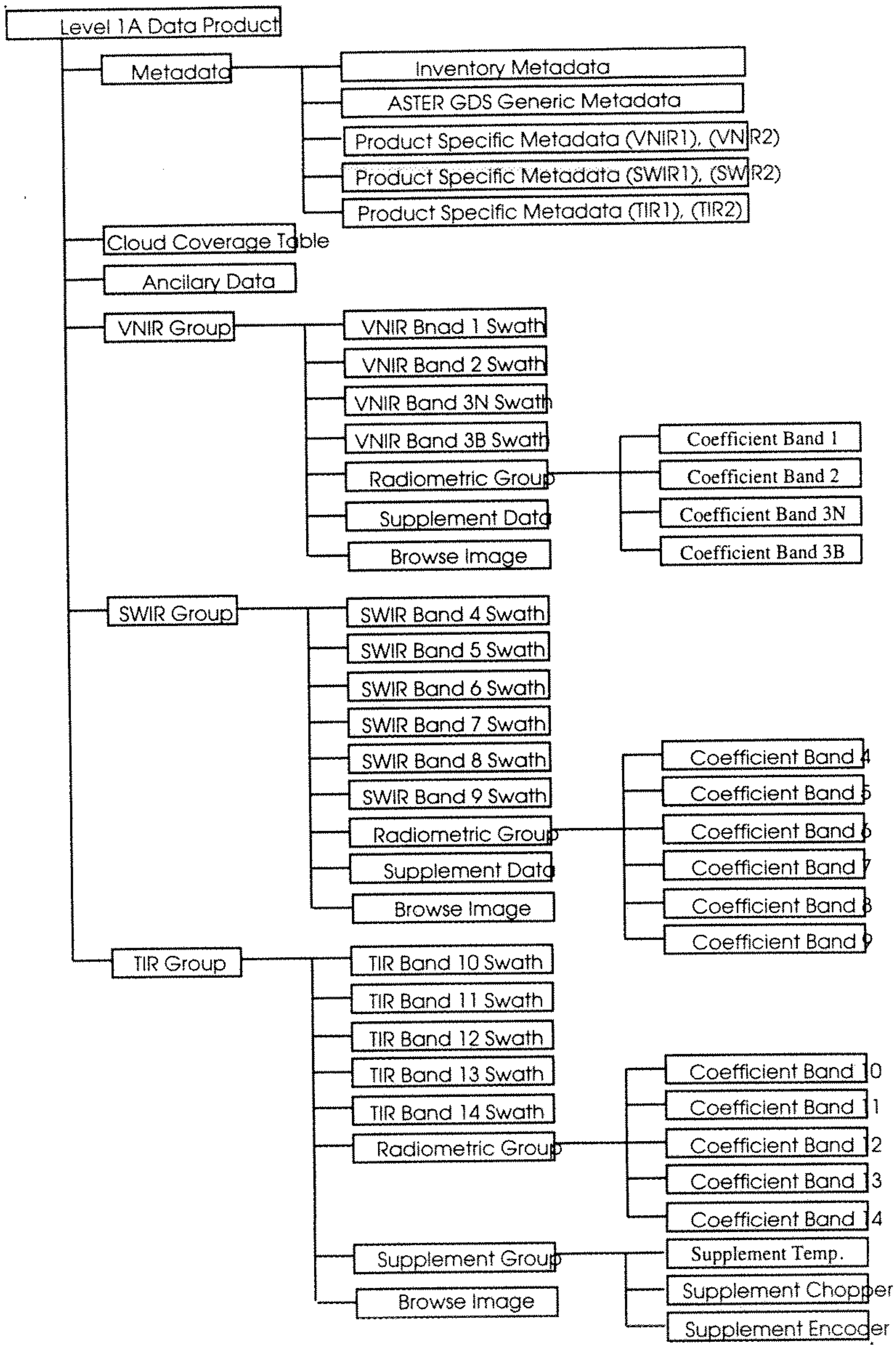


Figure 2.2-1 Physical Data of Level 1A Data Product

2.3 Data Format

2.3.1. Metadata

Level 1A Metadata consists of eight Master Groups, which are
(1) Inventory Metadata
(2) ASTER GDS Generic Metadata
(3) Product Specific Metadata(VNIR1): including the attribute about band-1 and 2 data.
(4) Product Specific Metadata(VNIR2): including the attribute about band-3N, 3B data and input (Level0)data.
(5) Product Specific Metadata(SWIR1): including the attribute about band-4, 5 and 6 data.
(6) Product Specific Metadata(SWIR2): including the attribute about band-7, 8, 9 data and input (Level0)data.
(7) Product Specific Metadata(TIR1): including the attribute about band-10,11 and 12 data.
(8) Product Specific Metadata(TIR2): including the attribute about band-13, 14 data and input (Level0)data.

About concept and definition of master groups, refer to SDP Toolkit Users Guide for the ECS Project, Appendix J.

2.3.1.1. Inventory Metadata

(1) Indexes of Objects
The object list of Inventory Metadata is shown in Table 2.3.1-1. Inventory metadata attributes apply to the whole L1A product, and are written to the HDF file attribute coremetadata.0.
Inventory metadata contains ASTER Meta-Parameters in Generic header for ASTER GDS Products (about Generic header for ASTER GDS Products, see ASTER LEVEL1 DATA PRODUCTS SPECIFICATION, science version, version 2). The attributes included in inventory metadata are associated with DID311.
(In Table 2.3.1-1, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)
The objects in *Itaric* character are not authorized by Level1 WG, and will be deleted in next version.

Table 2.3.1-1 List of Objects in Inventory Metadata(1/2)

No.		**Group**/Object Name	type(*1)	Description
1		SizeMBDataGranule	double	The volume of data contained in the granule.
2		PlatformShortName	string	'AM-1' fixed.
3		InstrumentShortName	string	'ASTER' fixed.
4		**BoundingRectangle**		This block contains area coverage for a granule.
	1	WestBoundingCoordinate	double	Western-most coordinate of the scene expressed in longitude.
	2	NorthBoundingCoordinate	double	Northern-most coordinate of the scene expressed in latitude.
	3	EastBoundingCoordinate	double	Eastern-most coordinate of the scene expressed in longitude.
	4	SouthBoundingCoordinate	double	Southern-most coordinate of the scene expressed in latitude.
5		**SingleDateTime**		This contains the time of day and calendar date for a granule.
	1	TimeofDay	string	format: HHMMSSSSSSSZ
	2	CalendarDate	string	format: YYYYMMDD
6		**Review**		This block provides for dates and status as applicable for collection which are active.

	1	FutureReviewDate	string	The date of the nearest planned QA peer review in future. format: YYYYMMDD

Table 2.3.1-1 List of Objects in Inventory Metadata(2/2)

No.		Group/Object Name	type(*1)	Description
6	2	ScienceReviewDate	string	The date of the last QA peer review. format: YYYYMMDD
7		**QAStats**		This block contains measures of quality for a granule.
	1	QAPercentMissingData	double	% of missing data of the scene.
	2	QAPercentOutofBoundsData	double	% of out of bounds data of the scene.
	3	QAPercentInterpolatedData	double	% of interpolated data of the scene.
8		ReprocessingActual	string	The stating what reprocessing has been performed on this granule. {not reprocessed, reprocessed once, reprocessed twice, free text}
9		PGEVersion	string	The version of PGE
10		ProcessingLevelID	string	The classification of the science data processing level: '1A'
11		MapProjectionName	string	The type of map projection used: 'N/A'
12		***AdditionalAttributes***		This group contains the product specific attributes definition.
		*AdditionalAttributesContainer(n)(*2)*		This container contains the additional attributes of the product. Currently, only Day/Night Flag is contained in this container.
	1	*AdditionalAttributeName(n)(*2)*	string	Name of additional attribute: Day/Night Flag
	2	*AdditionalAttributeDescription(n)(*2)*	string	Description of additional attribute: 'The Flag indicates observation condition'
	3	*AdditionalAttributeDataType(n)(*2)*	string	Data type of additional attribute: 'STRING'
13		*InformationContent*		This group contains the product specific attribute value.
		*InformationContentContainer(n)(*2)*		This container contains the information content. Currently, only Day/Night Flag is contained in this container.
	1	*ParameterValue(n)(*2)*	string	Value of additional attribute: 'DT': observation in daytime 'NT': observation in nighttime
14		*SensorShortName*	string	The short name for sensor(s) using in generating the product: 'ASTER_VNIR','ASTER_SWIR','ASTER_TIR','ASTER_STEREO'

NOTES:

(*1) Object types used in Metadata are

a. datetime: CCSDS A(UTC)Format

b. integer

c. double

d. string

(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

2.3.1.2. ASTER GDS Generic Metadata

(1) Indexes of Objects

The Object list of ASTER GDS Generic metadata is shown in Table 2.3.1-2. ASTER GDS Generic metadata attributes are written to the HDF file attribute productmetadata.0.

ASTER GDS Generic metadata contains ASTER Parameters in Generic Header for ASTER GDS Products (about Generic header for ASTER GDS Products, see ASTER LEVEL1 DATA PRODUCTS SPECIFICATION, science version, version 2). The ASTER Parameters are ASTER GDS specific attributes, i.e. not associated with DID311.

(In Table 2.3.1-2, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)

The objects in *Itaric* character are not authorized by Level1 WG, and will be deleted in next version.

Table 2.3.1-2 List of Object in ASTER GDS Generic Metadata (1/4)

No.		**Group**/Object Name	type(*1)	Description
1		IDofASTERGDSDataGranule	string	This provides a unique identifier for location of a data granule held in ASTER GDS.
2		RecievingCenter	string	'EDOS' fixed.
3		ProcessingCenter	string	'ASTER-GDS' fixed.
4		GenerationDateandTime	datetime	Generation date and time of this Level1A product.
5		**PointingAngles**		Specification of the pointing angles of ASTER sensors.
		PointingAnglesContainer(n)(*2)		n = number of sensors
	1	SensorName(n)(*2)	string	'VNIR' or 'SWIR' or 'TIR'
	2	PointingAngle(n)(*2)	double	pointing angle in degrees
	3	SettingTimeofPointing(n)(*2)	datetime	YYYY-MM-DDThh:mm:ssZ
6		**GainInformation**		The information of the gain level.
		GainInformationContainer(n)(*2)		This container contains the level of the data acquisition gain for VNIR and SWIR.
	1	Gain(n)(*2)	string	(Band Number, Band Gain) where , Band Number: '01','02','3N','3B','04','05','06','07','08','09' Band Gain: for VNIR: 'HGH': high gain 'NOR': normal gain 'LOW': low gain for SWIR: 'HGH': high gain 'NOR': normal gain 'LO1': low gain 1 'LO2': low gain 2 when data is not acquired or doesn't exist: 'OFF'
7		**CalibrationInformation**		Calibration information used to generate the geometric and radiometric correction tables.

Table 2.3.1-2 List of Object in ASTER GDS Generic Metadata (2/4)

No.			Group/Object Name	type(*1)	Description
7	1		GeometricDBversion	string	The version information of the geometric correction data. (Version, Issuance date, Comments)
	2		RadiometricDBversion	string	The version information of the radiometric correction data. (Version, Issuance date, Comments)
8			**DataQuality**		The information about the quality of this product.
	1		**CloudCoverage**		The information about the cloud coverage of the scene
		1	SceneCloudCoverage	integer	The percentage of cloud coverage for the whole scene.
		2	QuadrantCloudCoverage	integer	The percentages for 4 quarters of a scene in the order of: upper left -> upper right -> lower left -> lower right
9			SourceDataProduct	string	The information about the input data used for generating this Level-1A product. (DataID, GenDT, Datatyp) where, DataID: ID of Level-0 Data granule. GenDT: Generation date and time. Datatyp: Data type, 'PDS' or 'EDS'
10			**InstrumentInformation**		The information about sensors used to acquire data.
	1		ASTEROperationMode	string	The types of ASTER operation. 'OBSERVATION' or 'CALIBRATION' or 'TEST'
	2		**ObservationMode**		This group contains ASTER observation mode.
			ObservationModeContainer(n) (*2)		The container of ASTER observation mode.

			1	ASTERObservationMode(n)(*2)	string	The observation mode of each sensor group. (SGname, Observation) where, SGname : 'VNIR1' or 'VNIR2' or 'SWIR' or 'TIR' Observation : 'ON' (data is acquired) or 'OFF' (data is not acquired, or not existing in the granule)

Table 2.3.1-2 List of Object in ASTER GDS Generic Metadata (3/4)

No.		Parameter Name	type(*1)	Description
10	3	ProcessedBands	string	The status of all bands during observation. Format : set of flags described as 2-byte string. byte = 01,02,3N~14 (band 01,02,3N~14 data is acquired.) = XX (data corresponding to its band position is not acquired) Example : Value = "01023NXX0405XXXXXXXX1011121314"
11		**SceneInformation**		The information about the scene concerning with the data granule.
	1	ASTERSceneID	integer	The scene identifier defined by path, row and view. (path, row, view) where, path: 1-233(nominal) row: 1-TBD view: 1-TBD
	2	*AOSSceneID*	string	The scene ID defined by AOS (definition: TBD).
	3	OrbitNumber	integer	The orbit number of the satellite, when data is acquired.
	4	RecurrentCycleNumber	integer	The satellite recurrent cycle number and the revolution number in the cycle. (cycle No., revolution No.) where, cycle: 1-260(max.) revolution: 1-233(nominal)
	5	FlyingDirection	string	The satellite flight direction when observation is done. 'AS': ascending direction. 'DE': descending direction.
	6	SolarDirection	double	The sun direction as seen from the scene center. (az, el) where, az: azimuth angle in degree. 0.0 <= az < 360.0 measured eastward from North. el: elevation angle in degree. -90.0 <= el <= 90.0

	7	SpatialResolution	integer	The nominal spatial resolutions of VNIR, SWIR and TIR (unit : meter). (resolution of VNIR, resolution of SWIR, resolution of TIR)

Table 2.3.1-2 List of Object in ASTER GDS Generic Metadata (4/4)

No.			Parameter Name	type(*1)	Description
12			*SceneCoordinates*		This group contains the information of coordinates of the scene.
	1		***SceneCoord***		
			*SceneCoordContainer(n)(*2)*		The container of the scene coordinates, in the order of: upper left -> upper right -> lower left -> lower right
		1	*FourCornersLongandLat(n)(*2)*	double	Longitude and latitude of each corners of the full scene. unit : degree (long, lat) where, long: East longitude -180.0 <= long <= 180.0 lat: latitude -90.0 <= lat<= 90.0
	2		*CenterLongitudeandLatitude*	double	Longitude and latitude of the scene center. unit : degree (long, lat) where, long: East longitude -180.0 <= long <= 180.0 lat: latitude -90.0 <= lat <= 90.0
	3		***QuadSceneCoord***		
			*QuadSceneCoordContainer(n)(*2)*		This container contains longitudes and latitudes of the quadrant scene, in the order of: upper left -> upper right -> lower left -> lower right
		1	*FourCornersLongndLatofQuad(n)(*2)*	double	Longitude and latitude of 4 corners of the each quadrant, in the order of: upper left -> upper right -> lower left -> lower right ((long, lat)*4) where, long: East longitude (degree) -180.0 <= long <= 180.0 lat: latitude (degree) -90.0 <= lat <= 90.0
13			*IDofBrowseDatagranule*	string	Logical reference to the browse product.

NOTES:

(*1) Object types used in Metadata are
a. datetime: CCSDS A(UTC)Format
b. integer
c. double
d. string

(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

2.3.1.3. Product Specific Metadata(VNIR)

(1) Indexes of Objects

The Object list of Product Specific metadata(VNIR1) and Product Specific metadata(VNIR2) are shown in Table 2.3.1-3. Product Specific metadata(VNIR1) attributes (VNIRBand1Data and VNIRBand2Data Groups) are written to the HDF file attribute productmetadata.v1 and Product Specific metadata(VNIR2) attributes (VNIRBand3NData, VNIRBand3BData, Level0VNIR1Data and Level0VNIR2Data Groups) are written to productmetadata.v2.

Product Specific Metadata(VNIR1) and Product Specific metadata(VNIR2) include product specific attributes, i.e. not associated with DID311.

(In Table 2.3.1-3, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(1/11)

No.			**Group**/Object Name	type(*1)	Description
1			**VNIRBand1Data**		The information about VNIR band 1 of Level-1A.
	1		**ExtractionfromL01**		The information about the extraction from one or two Level 0 GROUP1 PDS (strip data) in order to make VNIR Band 1 Data.
			ExtractionfromL01Container(n)(*2)		
		1	RSC1(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2	SST1(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3	PDSid1(n)(*2)	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation1	integer	The information of VNIR band 1 image data. (npx, nln, bpp) where, npx: Number of pixels per line (4100: fixed) nln: Number of lines in frame (4200: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(2/11)

No.				Group/Object Name	type(*1)	Description
1	3			GeometricCorrection1	integer	The information of VNIR Band-1 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(10: nominal) nlpct: number of lattice points in across-track direction.(11: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (410: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (400: nominal)
	4			RadiometricCorrection1	integer	The information of VNIR Band-1 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(4100 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality1**		This group contains the information about the quality of Level1A VNIR Band-1 data.
		1		NumberofBadPixels1	integer	The information of missing data. (nmp, ndd, nmg) where, nmp: number of missing pixels. ndd: number of damaged detectors. nmg: number of contiguous missing pixel groups (abbreviated 'Missing Groups')
		2		**ListofBadPixels1**		This group contains the information about bad pixels.
				ListofBadPixels1Container(n)(*2)		
			1	DirectionofBadPixel1(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(3/11)

No.				Group/Object Name	type(*1)	Description
1	5	2	2	BadPixelLP1(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP1(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP1(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel1(n)(*2)	string	The cause of bad data: 'M' : Data Missing 'D' : Damaged Detector
	6			**UnitConversionCoeff1**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-01 image.
		1		Incl1	double	Inclination
		2		Offset1	double	Offset : 0.0 fixed.
		3		UnSatMin1	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax1	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit1	string	Converted Unit
2				**VNIRBand2Data**		The information about VNIR band 2 of Level-1A.
	1			**ExtractionfromL02**		The information about the extraction from one or two Level 0 GROUP1 PDS (strip data) in order to make VNIR Band 2 Data.
				ExtractionfromL02Container(n)(*2)		
		1		RSC2(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST2(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid2(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation2	integer	The information of VNIR Band 2 image data. (npx, nln, bpp) where, npx: Number of pixels per line(4100: fixed) nln: Number of lines in frame(4200: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(4/11)

No.				Group/Object Name	type(*1)	Description
2	3			GeometricCorrection2	integer	The information of VNIR Band-2 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(10: nominal) nlpct: number of lattice points in across-track direction.(11: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (410: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (400: nominal)
	4			RadiometricCorrection2	integer	The information of VNIR Band-2 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(4100 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality2**		This group contains the information about the quality of Level1A VNIR Band-2 data.
		1		NumberofBadPixels2	integer	The information of missing data. (nmp, ndd, nmg) where, nmp: number of missing pixels. ndd: number of damaged detectors. nmg: number of contiguous missing pixel groups (abbreviated 'Missing Groups')
		2		**ListofBadPixels2**		This group contains the information about bad pixels.
				ListofBadPixels2Container(n)(*2)		
			1	DirectionofBadPixel2(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP2(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(5/11)

No.				Group/Object Name	type(*1)	Description
2	5	2	3	BPSFirstLP2(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP2(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel2(n)(*2)	string	The cause of bad data: 'M' : Data Missing 'D' : Damaged Detector
	6			**UnitConversionCoeff2**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-02 image.
		1		Incl2	double	Inclination
		2		Offset2	double	Offset : 0.0 fixed.
		3		UnSatMin2	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax2	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit2	string	Converted Unit
3				**VNIRBand3NData**		The information about VNIR band 3N of Level-1A.
	1			**ExtractionfromL03N**		The information about the extraction from one or two Level 0 GROUP2 PDS (strip data) in order to make VNIR Band 3N Data.
				ExtractionfromL03NContainer (n)(*2)		
		1		RSC3N(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST3N(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid3N(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation3N	integer	The information of VNIR Band 3N image data. (npx, nln, bpp) where, npx: Number of pixels per line(4100: fixed) nln: Number of lines in frame(4200: nominal) bpp: Bytes per pixel (1 : fixed)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(6/11)

No.				Group/Object Name	type(*1)	Description
3	3			GeometricCorrection3N	integer	The information of VNIR Band-3N geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(10: nominal) nlpct: number of lattice points in across-track direction.(11: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (410: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (400: nominal)
	4			RadiometricCorrection3N	integer	The information of VNIR Band-3N radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(4100 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality3N**		This group contains the information about the quality of Level1A VNIR Band-3N data.
		1		NumberofBadPixels3N	integer	The information of missing data. (nmp, ndd, nmg) where, nmp: number of missing pixels. ndd: number of damaged detectors.nmg: number of contiguous missing pixel groups (abbreviated 'Missing Groups')
		2		**ListofBadPixels3N**		This group contains the information about bad pixels.
				ListofBadPixels3NContainer(n)(*2)		
			1	DirectionofBadPixel3N(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP3N(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(7/11)

No.				Group/Object Name	type(*1)	Description
3	5	2	3	BPSFirstLP3N(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP3N(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel3N(n)(*2)	string	The cause of bad data: 'M' : Data Missing 'D' : Damaged Detector
	6			**UnitConversionCoeff3N**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-3N image.
		1		Incl3N	double	Inclination
		2		Offset3N	double	Offset : 0.0 fixed.
		3		UnSatMin3N	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax3N	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit3N	string	Converted Unit
4				**VNIRBand3BData**		The information about VNIR band 3B of Level-1A.
	1			**ExtractionfromL03B**		The information about the extraction from one or two Level 0 GROUP2 PDS (strip data) in order to make VNIR Band 3BData.
				ExtractionfromL03BContainer (n)(*2)		
		1		RSC3B(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST3B(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid3B(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation3B	integer	The information of VNIR Band 3B image data. (npx, nln, bpp) where, npx: Number of pixels per line(5000: fixed) nln: Number of lines in frame(4600: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(8/11)

No.				Group/Object Name	type(*1)	Description
4	3			GeometricCorrection3B	integer	The information of VNIR Band-3B geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(10: :nominal) nlpct: number of lattice points in across-track direction.(12: :nominal) dlpat: distance between two neighbor lattice points in along-track direction. (500: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (400: nominal)
	4			RadiometricCorrection3B	integer	The information of VNIR Band-3B radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(5000 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality3B**		This group contains the information about the quality of Level1A VNIR Band-3B data.
		1		NumberofBadPixels3B	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels3B**		This group contains the information about bad pixels.
				ListofBadPixels3BContainer(n)(*2)		
			1	DirectionofBadPixel3B(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP3B(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(9/11)

No.				Group/Object Name	type(*1)	Description
4	5	2	3	BPSFirstLP3B(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP3B(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel3B(n)(*2)	string	The cause of bad data: 'M' : Data Missing 'D' : Damaged Detector
	6			**UnitConversionCoeff3B**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-3B image.
		1		Incl3B	double	Inclination
		2		Offset3B	double	Offset : 0.0 fixed.
		3		UnSatMin3B	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax3B	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit3B	string	Converted Unit
	7			**FirstPixelAddressGroup**		This group identifies the address of the first available pixel in each refreshing cycle of VNIR band-3B image data.
		1		Ncycles	integer	Number of refreshing cycle. Since there are as many as 9 refreshing cycles in a frame data, nominal value for Ncycles is 9.
		2		**FPAddress**		
				FPAddressContainer(n)(*2)		This container contains relative scan number and address for each refreshing cycle.
			1	FirstPixelAddress(n)(*2)	integer	(Sc-n, Ad-n) where, Sc-n : Relative scan count in n-th cycle. Ad-n : Address in n-th cycle.
5				**Level0VNIR1Data**		The information about Level-0 VNIR Group-1 which contains VNIR band 1 and 2 data.
	1			**PhysicalUnit1**		The information about Level-0 VNIR Group-1 physical unit.
		1		BarCodeID1	string	Bar code serial number of the physical unit.
		2		CompletionDate1	datetime	Date and time of completion of the physical media.

3		PDSCounts1	integer	Total number of PDSs on the physical unit (<=9999)

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(10/11)

No.			**Group**/Object Name	type(*1)	Description
5	2		**L0DataSet1**		This group contains the information of L0 VNIR Group-1 data set(PDSs).
			L0DataSet1Container(n)(*2)		The information about PDSs of Level-0 Group-1.
		1	PDSid1(n)(*2)	string	Identifier of this PDS assigned by EDOS.
		2	FirstPacketTime1(n)(*2)	datetime	First packet time for this PDS.
		3	LastPacketTime1(n)(*2)	datetime	Last packet time for this PDS.
		4	PacketCounts1(n)(*2)	integer	Number of packets in this PDS.
	3		L0DataType1	string	The identifier of the input data type (defined by EDOS). 'PDS': Production Data Set 'EDS': Expedited Data Set 'TEST' : Test Data
	4		**L0DataQuality1**		This specifies the number of input packets used to generate the data granule, and these quality.
		1	SensorGroupName1	string	Sensor group name: 'VNIR1' (fixed)
		2	NumberofPackets1	integer	Number of packets used to generate the scene data of each group.
		3	PercentofMissingPackets1	double	percent of missing packets of each group. Unit: %
		4	PercentofCorrectedPackets1	double	percent of packets with errors corrected by Reed Solomon (R-S) decoding. Unit: %
6			**Level0VNIR2Data**		The information about Level-0 VNIR Group-2 which contains VNIR band 3N and 3B data.
	1		**PhysicalUnit2**		The information about Level-0 VNIR Group-2 physical unit.
		1	BarCodeID2	string	Bar code serial number of the physical unit.
		2	CompletionDate2	datetime	Date and time of completion of the physical media.
		3	PDSCounts2	integer	Total number of PDSs on the physical unit (<=9999)
	2		**L0DataSet2**		This group contains the information of L0 VNIR Group-2 data set(PDSs).
			L0DataSet2Container(n)(*2)		The information about PDSs of Level-0 Group-2.
		1	PDSid2(n)(*2)	string	Identifier of this PDS assigned by EDOS.

		2	FirstPacketTime2(n)(*2)	datetime	First packet time for this PDS.
		3	LastPacketTime2(n)(*2)	datetime	Last packet time for this PDS.

Table 2.3.1-3 List of Object in Level1A Product Specific Metadata(VNIR)(11/11)

No.			Group/Object Name	type(*1)	Description
6	2	4	PacketCounts2(n)(*2)	integer	Number of packets in this PDS.
	3		L0DataType2	string	The identifier of the input data type (defined by EDOS). 'PDS': Production Data Set 'EDS': Expedited Data Set 'TEST' : Test Data
	4		**L0DataQuality2**		This specifies the number of input packets used to generate the data granule, and these quality.
		1	SensorGroupName2	string	Sensor group name: 'VNIR2' (fixed)
		2	NumberofPackets2	integer	Number of packets used to generate the scene data of each group.
		3	PercentofMissingPackets2	double	percent of missing packets of each group. Unit: %
		4	PercentofCorrectedPackets2	double	percent of packets with errors corrected by Reed Solomon (R-S) decoding. Unit: %

NOTES:

(*1) Object types used in Metadata are

- a. datetime: CCSDS A(UTC)Format
- b. integer
- c. double
- d. string

(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

2.3.1.4. Product Specific Metadata(SWIR)

(1) Indexes of Objects
The Object list of Product Specific metadata(SWIR1) and Product Specific metadata(SWIR2) are shown in Table 2.3.1-4. Product Specific metadata(SWIR1) attributes (SWIRBand4Data, SWIRBand5Data and SWIRBand6Data Groups) are written to the HDF file attribute productmetadata.s1 and Product Specific metadata(SWIR2) attributes (SWIRBand7Data, SWIRBand8Data, SWIRBand9Data, Level0SWIRData, SWIR Registration Quality and Parallax Correction quality Groups) are witten to pruductmetadata.s2.
Product Specific Metadata(SWIR1) and Product Specific metadata(SWIR2) include product specific attributes, i.e. not associated with DID311.
(In Table 2.3.1-4, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(1/15)

No.			**Group**/Object Name	type(*1)	Description
1			**SWIRBand4Data**		The information about SWIR band 4 of Level-1A.
	1		**ExtractionfromL04**		The information about the extraction from one or two Level 0 GROUP3 PDS(strip data) in order to make SWIR band 4 data.
			ExtractionfromL04Container(n)(*2)		
		1	RSC4(n)(*2)	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST4(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3	PDSid4(n)(*2)	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation4	integer	The information of SWIR band 4 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(2/15)

No.				Group/Object Name	type(*1)	Description
1	3			GeometricCorrection4	integer	The information of SWIR Band-4 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4			RadiometricCorrection4	integer	The information of SWIR Band-4 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality4**		This group contains the information about the quality of Level1A SWIR Band-4 data.
		1		NumberofBadPixels4	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels4**		This group contains the information about bad pixels.
				ListofBadPixels4Container(n)(*2)		
			1	DirectionofBadPixel4(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP4(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(3/15)

No.				Group/Object Name	type(*1)	Description
1	5	2	3	BPSFirstLP4(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP4(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel4(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff4**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-4 image.
		1		Incl4	double	Inclination
		2		Offset4	double	Offset : 0.0 fixed.
		3		UnSatMin4	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax4	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit4	string	Converted Unit
2				**SWIRBand5Data**		The information about SWIR band 5 of Level-1A.
	1			**ExtractionfromL05**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 5 Data.
				ExtractionfromL05Container(n)(*2)		
		1		RSC5(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST5(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid5(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation5	integer	The information of SWIR band 5 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(4/15)

No.				Group/Object Name	type(*1)	Description
2	3			GeometricCorrection5	integer	The information of SWIR Band-5 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4			RadiometricCorrection5	integer	The information of SWIR Band-5 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality5**		This group contains the information about the quality of Level1A SWIR Band-5 data.
		1		NumberofBadPixels5	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors.nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels5**		This group contains the information about bad pixels.
				ListofBadPixels5Container(n)(*2)		
			1	DirectionofBadPixel5(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP5(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(5/15)

No.				Group/Object Name	type(*1)	Description
2	5	2	3	BPSFirstLP5(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP5(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel5(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff5**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-5 image.
		1		Incl5	double	Inclination
		2		Offset5	double	Offset : 0.0 fixed.
		3		UnSatMin5	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax5	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit5	string	Converted Unit
3				**SWIRBand6Data**		The information about SWIR band 6 of Level-1A.
	1			**ExtractionfromL06**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 6 Data.
				ExtractionfromL06Container(n)(*2)		
		1		RSC6(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST6(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid6(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation6	integer	The information of SWIR band 6 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(6/15)

No.				Group/Object Name	type(*1)	Description
3	3			GeometricCorrection6	integer	The information of SWIR Band-6 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4			RadiometricCorrection6	integer	The information of SWIR Band-6 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality6**		This group contains the information about the quality of Level1A SWIR Band-6 data.
		1		NumberofBadPixels6	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels6**		This group contains the information about bad pixels.
				ListofBadPixels6Container(n)(*2)		
			1	DirectionofBadPixel6(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP6(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(7/15)

No.				Group/Object Name	type(*1)	Description
3	5	2	3	BPSFirstLP6(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP6(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel6(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff6**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-6 image.
		1		Incl6	double	Inclination
		2		Offset6	double	Offset : 0.0 fixed.
		3		UnSatMin6	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax6	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit6	string	Converted Unit
4				**SWIRBand7Data**		The information about SWIR band 7 of Level-1A.
	1			**ExtractionfromL07**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 7 Data.
				ExtractionfromL07Container(n)(*2)		
		1		RSC7(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST7(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid7(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation7	integer	The information of SWIR band 7 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(8/15)

No.				**Group**/Object Name	type(*1)	Description
4	3			GeometricCorrection7	integer	The information of SWIR Band-7 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4			RadiometricCorrection7	integer	The information of SWIR Band-7 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality7**		The information of VNIR Band-7 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
		1		NumberofBadPixels7	integer	The information about bad pixels. (nmp, nelm, ndd) where, nmp: number of missing pixels. nelm: number of elements of the next list of bad pixels. ndd: number of damaged detectors.
		2		**ListofBadPixels7**		This group contains the information about bad pixels.
				ListofBadPixels7Container(n)(*2)		
			1	DirectionofBadPixel7(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(9/15)

No.				Group/Object Name	type(*1)	Description
4	5	2	2	BadPixelLP7(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP7(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP7(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel7(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff7**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-7 image.
		1		Incl7	double	Inclination
		2		Offset7	double	Offset : 0.0 fixed.
		3		UnSatMin7	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax7	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit7	string	Converted Unit
5				**SWIRBand8Data**		The information about SWIR band 8 of Level-1A.
	1			**ExtractionfromL08**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 8 Data.
				ExtractionfromL08Container(n)(*2)		
		1		RSC8(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST8(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid8(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation8	integer	The information of SWIR band 7 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(10/15)

No.				Group/Object Name	type(*1)	Description
5	3			GeometricCorrection8	integer	The information of SWIR Band-8 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4			RadiometricCorrection8	integer	The information of SWIR Band-8 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality8**		This group contains the information about the quality of Level1A SWIR Band-8 data.
		1		NumberofBadPixels8	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels8**		This group contains the information about bad pixels.
				ListofBadPixels8Container(n)(*2)		
			1	DirectionofBadPixel8(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP8(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(11/15)

No.				Group/Object Name	type(*1)	Description
5	5	2	3	BPSFirstLP8(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP8(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel8(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff8**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-8 image.
		1		Incl8	double	Inclination
		2		Offset8	double	Offset : 0.0 fixed.
		3		UnSatMin8	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax8	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit8	string	Converted Unit
6				**SWIRBand9Data**		The information about SWIR band 9 of Level-1A.
	1			**ExtractionfromL09**		The information about the extraction from one or two Level 0 GROUP3 PDS (strip data) in order to make SWIR Band 9 Data.
				ExtractionfromL09Container(n)(*2)		
		1		RSC9(n)(*2)	integer	RSC(relative scan count) of first & last scan(>=0). RSC is scan count in each PDS.
		2		SST9(n)(*2)	datetime	SST(scan start time) of first & last scan.
		3		PDSid9(n)(*2)	string	Identifier of PDS including first & last scan.
	2			ImageDataInformation9	integer	The information of SWIR band 9 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2048: fixed) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(12/15)

No.				Group/Object Name	type(*1)	Description
6	3			GeometricCorrection9	integer	The information of SWIR Band-9 geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction.(103: nominal) nlpct: number of lattice points in across-track direction.(105: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (20: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (20: nominal)
	4			RadiometricCorrection9	integer	The information of SWIR Band-9 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(2048 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality9**		This group contains the information about the quality of Level1A SWIR Band-9 data.
		1		NumberofBadPixels9	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels9**		This group contains the information about bad pixels.
				ListofBadPixels9Container(n)(*2)		
			1	DirectionofBadPixel9(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP9(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(13/15)

No.				Group/Object Name	type(*1)	Description
6	5	2	3	BPSFirstLP9(n)(*2)	integer	First pixel number (in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP9(n)(*2)	integer	Last pixel number (in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel9(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector
	6			**UnitConversionCoeff9**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-9 image.
		1		Incl9	double	Inclination
		2		Offset9	double	Offset : 0.0 fixed.
		3		UnSatMin9	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax9	integer	Maximum value of unsaturated pixel : 254 fixed.
		5		ConUnit9	string	Converted Unit
7				**Level0SWIRData**		The information about Level-0 SWIR which contains VNIR band 3N and 3B data.
	1			**PhysicalUnit**		The information about Level-0 SWIR physical unit.
		1		BarCodeID	string	Bar code serial number of the physical unit.
		2		CompletionDate	datetime	Date and time of completion of the physical media.
		3		PDSCounts	integer	Total number of PDSs on the physical unit (<=9999)
	2			**L0DataSet**		This group contains the information of L0 SWIR data set(PDSs).
				L0DataSetContainer(n)(*2)		The information about PDSs of Level-0 Group-3.
		1		PDSid(n)(*2)	string	Identifier of this PDS assigned by EDOS.
		2		FirstPacketTime(n)(*2)	datetime	First packet time for this PDS.
		3		LastPacketTime(n)(*2)	datetime	Last packet time for this PDS.
		4		PacketCounts(n)(*2)	integer	Number of packets in this PDS.
	3			L0DataType	string	The identifier of the input data type (defined by EDOS). 'PDS': Production Data Set 'EDS': Expedited Data Set 'TEST' : Test Data

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(14/15)

No.			Group/Object Name	type(*1)	Description
7	4		**L0DataQuality**		This specifies the number of input packets used to generate the data granule, and these quality.
		1	SensorGroupName	string	Sensor group name: 'SWIR' (fixed)
		2	NumberofPackets	integer	Number of packets used to generate the scene data of each group.
		3	PercentofMissingPackets	double	percent of missing packets of each group. Unit: %
		4	PercentofCorrectedPackets	double	percent of packets with errors corrected by Reed Solomon (R-S) decoding. Unit: %
8			**SWIRRegistrationQuality**		The registration information of SWIR based on VNIR.
	1		ProcessingFlag	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
	2		NumberofMeasurements	integer	The number of measurements
	3		MeasurementPointNumber	integer	The number of measurement points.
	4		AverageOffset	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
	5		StandardDeviationOffset	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
	6		Threshold	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
9			**ParallaxCorrectionQuality**		The information of SWIR parallax correction.

Table 2.3.1-4 List of Object in Level1A Product Specific Metadata(SWIR)(15/15)

No.		Group/Object Name	type(*1)	Description
9	1	PctImageMatch	integer	The percent of image matching used in the SWIR parallax collection processing.
	2	AvgCorrelCoef	double	The Average Correlation Coefficient.
	3	Cthled	double	The Correlation Threshold value.

NOTES:

(*1) Object types used in Metadata are

a. datetime: CCSDS A(UTC)Format

b. integer

c. double

d. string

(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

2.3.1.5. Product Specific Metadata(TIR)

(1) Indexes of Objects

The Object list of Product Specific metadata(TIR1) and Product Specific metadata(TIR2) are shown in Table 2.3.1-5. Product Specific metadata(TIR1) attributes(TIRBand10Data, TIRBand11Data and TIRBand12Data Groups) are written to the HDF file attribute productmetadata.t1 and Product Specific metadata(TIR2) attributes(TIRBand13Data, TIRBand14Data, Level0TIRData and TIRRegistrationQuality Groups) are written to the HDF file attribute productmetadata.t2.
Product Specific Metadata(TIR1) and Product Specific metadata(TIR2) include product specific attributes, i.e. not associated with DID311.
(In Table 2.3.1-5, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(1/12)

No.			Group/Object Name	type(*1)	Description
1			**TIRBand10Data**		The information about TIR band 10 of Level-1A.
	1		**ExtractionfromL010**		The information about the extraction from level 0 strip data.
		1	RSC10	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST10	datetime	SST(scan start time) of first & last scan.
		3	PDSid10	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation10	integer	The information of TIR band 10 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection10	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(2/12)

No.				Group/Object Name	type(*1)	Description
1	4			RadiometricCorrection10	integer	The information of TIR Band-10 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)
	5			**DataQuality10**		This group contains the information about the quality of Level1A TIR data.
		1		NumberofBadPixels10	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels10**		This group contains the information about bad pixels.
				ListofBadPixels10Container(n)(*2)		
			1	DirectionofBadPixel10(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP10(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP10(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP10(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel10(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6			**UnitConversionCoeff10**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-10 image.
		1		Incl10	double	Inclination
		2		Offset10	double	Offset : 0.0 fixed.
		3		UnSatMin10	integer	Minimum value of unsaturated pixel : 0 fixed.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(3/12)

No.			Group/Object Name	type(*1)	Description
1	6	4	UnSatMax10	integer	Maximum value of unsaturated pixel.
		5	ConUnit10	string	Converted Unit.
2			**TIRBand11Data**		The information about TIR band 11 of Level-1A.
	1		**ExtractionfromL011**		The information about the extraction from level 0 strip data.
		1	RSC11	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST11	datetime	SST(scan start time) of first & last scan.
		3	PDSid11	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation11		The information of TIR band 11 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection11	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)
	4		RadiometricCorrection11	integer	The information of TIR Band-11 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(4/12)

No.				Group/Object Name	type(*1)	Description
2	5			**DataQuality11**		This group contains the information about the quality of Level1A TIR data.
		1		NumberofBadPixels11	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels11**		This group contains the information about bad pixels.
				ListofBadPixels11Container(n)(*2)		
			1	DirectionofBadPixel11(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP11(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP11(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP11(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel11(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6			**UnitConversionCoeff11**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-11 image.
		1		Incl11	double	Inclination
		2		Offset11	double	Offset : 0.0 fixed.
		3		UnSatMin11	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax11	integer	Maximum value of unsaturated pixel.
		5		ConUnit11	string	Converted Unit.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(5/12)

No.			Group/Object Name	type(*1)	Description
3			**TIRBand12Data**		The information about TIR band 12 of Level-1A.
	1		**ExtractionfromL012**		The information about the extraction from level 0 strip data.
		1	RSC12	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST12	datetime	SST(scan start time) of first & last scan.
		3	PDSid12	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation12		The information of TIR band 12 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection12	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)
	4		RadiometricCorrection12	integer	The information of TIR Band-12 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(6/12)

No.				Group/Object Name	type(*1)	Description
3	5			**BandDataQuality12**		This group contains the information about the quality of Level1A TIR data.
		1		NumberofBadPixels12	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels12**		This group contains the information about bad pixels.
				ListofBadPixels12Container(n)(*2)		
			1	DirectionofBadPixel12(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP12(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP12(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP12(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel12(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6			**UnitConversionCoeff12**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-12 image.
		1		Incl12	double	Inclination
		2		Offset12	double	Offset : 0.0 fixed.
		3		UnSatMin12	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax12	integer	Maximum value of unsaturated pixel.
		5		ConUnit12	string	Converted Unit.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(7/12)

No.			Group/Object Name	type(*1)	Description
4			**TIRBand13Data**		The information about TIR band 13 of Level-1A.
	1		**ExtractionfromL013**		The information about the extraction from level 0 strip data.
		1	RSC13	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST13	datetime	SST(scan start time) of first & last scan.
		3	PDSid13	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation13		The information of TIR band 13 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection13	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)
	4		RadiometricCorrection13	integer	The information of TIR Band-13 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(8/12)

No.				Group/Object Name	type(*1)	Description
4	5			**BandDataQuality13**		This group contains the information about the quality of Level1A TIR data.
		1		NumberofBadPixels13	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels13**		This group contains the information about bad pixels.
				ListofBadPixels13Container(n)(*2)		
			1	DirectionofBadPixel13(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP13(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP13(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP13(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel13(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6			**UnitConversionCoeff13**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-13 image.
		1		Incl13	double	Inclination
		2		Offset13	double	Offset : 0.0 fixed.
		3		UnSatMin13	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax13	integer	Maximum value of unsaturated pixel.
		5		ConUnit13	string	Converted Unit.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(9/12)

No.			Group/Object Name	type(*1)	Description
5			**TIRBand14Data**		The information about TIR band 14 of Level-1A.
	1		**ExtractionfromL014**		The information about the extraction from level 0 strip data.
		1	RSC14	integer	RSC(relative scan count) of first & last scan (>=0). RSC is scan count in each PDS.
		2	SST14	datetime	SST(scan start time) of first & last scan.
		3	PDSid14	string	Identifier of PDS including first & last scan.
	2		ImageDataInformation14		The information of TIR band 14 image data. (npx, nln, bpp) where, npx: number of pixels per line(716: fixed) nln: number of line in frame(700: nominal) bpp: bytes per pixel (0: fixed)
	3		GeometricCorrection14	integer	The information of TIR geometric correction table. (nlpat, nlpct, dlpat, dlpct) where, nlpat: number of lattice points in along-track direction. (11: nominal) nlpct: number of lattice points in across-track direction. (10: nominal) dlpat: distance between two neighbor lattice points in along-track direction. (70: nominal) dlpct: distance between two neighbor lattice points in across-track direction. (70: nominal)
	4		RadiometricCorrection14	integer	The information of TIR Band-14 radiometric correction table. (ndct, npara) where, ndct: number of detectors used.(10 : fixed) npara: number of parameters (3 : fixed)

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(10/12)

No.				Group/Object Name	type(*1)	Description
5	5			**BandDataQuality14**		This group contains the information about the quality of Level1A TIR data.
		1		NumberofBadPixels14	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels14**		This group contains the information about bad pixels.
				ListofBadPixels14Container(n)(*2)		
			1	DirectionofBadPixel14(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP14(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP14(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP14(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel14(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector
	6			**UnitConversionCoeff14**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-14 image.
		1		Incl14	double	Inclination
		2		Offset14	double	Offset : 0.0 fixed.
		3		UnSatMin14	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax14	integer	Maximum value of unsaturated pixel.
		5		ConUnit14	string	Converted Unit.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(11/12)

No.			Group/Object Name	type(*1)	Description
6			**Level0TIRData**		The information about Level-0 TIR data.
	1		**PhysicalUnit**		The information about Level-0 TIR physical unit.
		1	BarCodeID	string	Bar code serial number of the physical unit.
		2	CompletionDate	datetime	Date and time of completion of the physical media.
		3	PDSCounts	integer	Total number of PDSs on the physical unit (<=9999)
	2		**L0Dataset**		This group contains the information of L0 TIR Group-10 data set(PDSs).
			L0DataSetContainer(n)(*2)		The information about PDSs of Level-0 TIR data.
		1	PDSid(n)(*2)	string	Identifier of this PDS assigned by EDOS.
		2	FirstPacketTime(n)(*2)	datetime	First packet time for this PDS.
		3	LastPacketTime(n)(*2)	datetime	Last packet time for this PDS.
		4	PacketCounts(n)(*2)	integer	Number of packets in this PDS.
	3		L0DataType	string	The identifier of the input data type (defined by EDOS). 'PDS': Production Data Set 'EDS': Expedited Data Set 'TEST' : Test Data
	4		**L0DataQuality**		This specifies the number of input packets used to generate the data granule, and these quality.
		1	SensorGroupName	string	Sensor group name: 'TIR' (fixed)
		2	NumberofPackets	integer	Number of packets used to generate the scene data of each group.
		3	PercentofMissingPackets	double	percent of missing packets of each group. Unit: %
		4	PercentofCorrectedPackets	double	percent of packets with errors corrected by Reed Solomon (R-S) decoding. Unit: %
7			**TIRRegistrationQuality**		The registration information of TIR based on VNIR.
	1		ProcessingFlag	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.

Table 2.3.1-5 List of Object in Level1A Product Specific Metadata(TIR)(12/12)

No.		**Group**/Object Name	type(*1)	Description
7	2	NumberofMeasurements	integer	The number of measurements
	3	MeasurementPointNumber	integer	The number of measurement points.
	4	AverageOffset	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
	5	StandardDeviationOffset	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
	6	Threshold	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold

NOTES:

(*1) Object types used in Metadata are
- a. datetime: CCSDS A(UTC)Format
- b. integer
- c. double
- d. string

(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

2.3.2. Cloud Coverage Table

(1) Description

Cloud coverage table is available for Level 1A Product corresponding to each ASTER Observation (OBS) modes.

(2) Characteristics(TBD)

a) Data model: SDS (2 Dimension Array)

b) Object Name: Cloud_Coverage_Table

c) Format: Refer to Table 2.3.2-1

d) Contents: each element is 1 byte data, indicates clear (= 0) or cloudy (= 1) for the rectangular area which is centered by the SWIR Band 6 lattice point.

Table 2.3.2-1 Size of Cloud Coverage Data

Reference Coordinates	Dimension Size	Variable Type
SWIR	[n][103]*	UINT8
VNIR	[n][10]*	UINT8
TIR	[n][11]*	UINT8

* Line size (n: 105 or 106 in case of SWIR) is depending on a processing scene.

Note 1: Reference Coordinates will change depending on condition of observation.

a) In nominal case, the lattice coordinates of SWIR Geometric Correction Table(GCT) is used as center of evaluation rectangle.

b) If SWIR data is not available, the lattice coordinate of VNIR GCT will be used as center instead.

c) If both SWIR and VNIR data are not available, the lattice coordinate of TIR GCT will be used .

Note 2: Evaluation area size is shown as follows.

Reference Coordinate	SWIR	VNIR	TIR
Evaluation area size	20P	410P	70P
	20L	400L	70L

2.3.3. Ancillary Data

(1) Description

Ancillary Data include the satellite's orbit/attitude data, and their time tags. Since ancillary data appended to onboard instrument data are updated once per major cycle time (1.024 sec), in order to match with the scene observation time of 9.5 sec (63 km), an extra number of ancillary data will be extracted and provided. To ensure the conformity with instrument data, "zeroes" are assigned to the leading ancillary data of each sensor, and called Relative Scan Number. This is used as control data for extracted Image Data.

(2) Characteristics (TBD)

a) Data model: Vdata

b) Object Name: Ancillary_Data

c) Class Name: Anci_Record.*n* (*n*: Record count number)

d) Format and contents: Table 2.3.3-1 shows the format and the contents of Ancillary Data. Some Ancillary Data contains multiple entries per field. Order which is the number of components in a field is shown in Table 2.3.3-1.

Table 2.3.3-1 Format of Ancillary Data (1/2)

Field Name	Order	Variable Size	Description
Relative_Scan_No	3	UINT32	Relative Scan Number
Primary_Header	6	UINT8	CCSDS Primary Packet Header for downlink, used for ground routing and processing.
Secondary_Header	8	UINT8	This field is part of the secondary header of the packet for downlink. Bit 0: Secondary Header ID Flag (always a data zero) Bit 1-63: Time Stamp - Epoch of the data in the ancillary data message. Spacecraft clock time in CCSDS Day-Segmented Format. The code epoch is January 1, 1958.
Flag_Byte	1	UINT8	Flag Byte - Flags for ground data processing control. First (most significant) bit is the "quick look" bit. Other bits are reserved and will contain data zero. This field is part of the secondary header of the packet for downlink.
Time_Conversion	3	UINT8	Time Conversion - Estimated difference between UTC and the Spacecraft Clock. This may be added to the Spacecraft Clock time to derive UTC time.
Position	3	UINT32	Spacecraft Position (x, y, z) - Estimated position of the spacecraft, expressed in Earth Centered Inertial frame (mean Equator and Equinox of J2000).
Velocity	3	UINT32	Spacecraft Velocity (x, y, z) - Estimated velocity of the spacecraft, expressed in Earth Centered Inertial frame (mean Equator and Equinox of J2000).
Attitude_Angle	3	UINT16	Attitude Angle (Roll, Pitch, Yow) - The estimated attitude of the spacecraft, expressed in the Orbital Reference frame.
Attitude_Rate	3	UINT16	Attitude Rate (Roll, Pitch, Yow) - The estimated attitude rate of the spacecraft, expressed in the Orbital Reference frame.
Magnetic_Coil	3	UINT8	Magnetic Coil Current (x, y, z) - Currents flowing in each of the magnetic torque coils used for Spacecraft momentum unloading.

Solar_Arrary	1	UINT8	Solar Array Current - Current flowing from the Spacecraft solar array.

Table 2.3.3-1 Format of Ancillary Data (2/2)

Field Name	Component	Variable Size	Description
Solar_Position	3	UINT8	Solar Position (x, y, z) - Components of unit vector, expressed in the Spacecraft Reference frame, pointing in the direction of the Sun.
Moon_Position	3	UINT8	Moon Position (x, y, z) - Components of the unit vector, expressed in the Spacecraft Reference frame, pointing in the direction of the Moon.

Note: Resolution and Range are shown as follows.

Ancillary Data	Resolution	Range
Primary Header	N/A	N/A
Secondary Header	N/A	N/A
Time Stamp	1 msec	1958-2047
Flag Byte	N/A	N/A
Time Conversion	1 msec	msec
Spacecraft Position	0.125 m	m
Spacecraft Velocity		
Attitude Angle	1.0 arcsec	arcsec

Attitude Rate	0.5 arcsec	arcsec
Magnetic Coil Current	A	A
Solar Array Current	1.0 A	0-256 A
Solar Position		1
Moon Position		1

2.3.4. VNIR Group

2.3.4.1 Overview

VNIR Group contains a Vdata, and a RIS24, a series of Swath Objects through the use of the Vgroup API. Vgroup name which establishes access to a Vgroup is as follows.

vgroup name: VNIR_Group

2.3.4.2. VNIR Band 1 Swath

(1) Structure
A single swath contains any number of Tables and Multidimensional Arrays. There is however one type of information that is special: geolocation information. In a swath, geolocation information is stored as a series of arrays. We require that every swath contain some geolocation component. The data itself is stored in multidimensional arrays in the swath. The only limitation is that the first dimension is the Track dimension. Each Band is stored as separate Swath structure, one per geolocation object. Consider Figure 2.3.4-1, which is represent of a swath consisting of a combination of 2D and 3D data arrays, a series of 2D geolocation arrays, a series of data tables, and a single 1D geolocation tables.

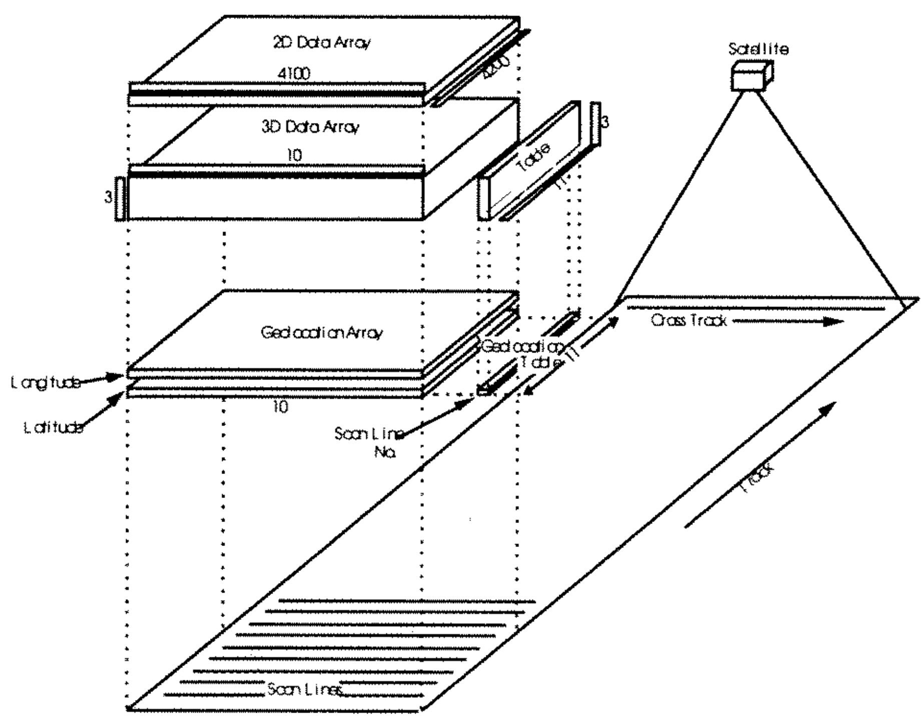


Figure 2.3.4-1 Conceptual View of Example of Swath

(2) Characteristics
Table 2.3.4-1 shows the List of data items in VNIR Band 1 Swath.

a) Data model: Swath
b) Object Name: VNIR_Band1
c) Format: Table 2.3.4-1 shows the contents of Swath Object. Table 2.3.4-2 shows the format of one.

Table 2.3.4-1 List of data items in Level 1A VNIR Band 1 Swath

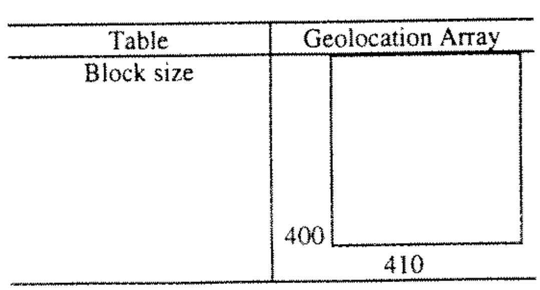
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.4-2 Format of data items in VNIR Band 1 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][10]	DOUBLE	geolocation field (Array)
Longitude	[n][10]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][10][2]	INT32	mapping to geolocation array
SightVector	[n][10][3]	DOUBLE	mapping to geolocation array
Altitude	[n][10]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[4200][4100]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.



Scan Line No. is skipped along line dimension. (one per 400 lines in image data).

2.3.4.3. VNIR Band 2 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.4-3 shows the List of data items in VNIR Band 2 Swath.

a) Data model: Swath
b) Object Name: VNIR_Band2
c) Format: Table 2.3.4-3 shows the contents of Swath Object. Table 2.3.4-4 shows the format of one.

Table 2.3.4-3 List of data items in Level 1A VNIR Band 2 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

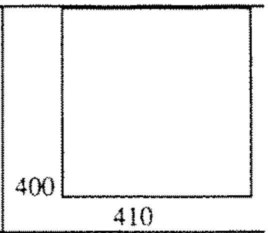
Table 2.3.4-4 Format of data items in VNIR Band 2 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][10]	DOUBLE	geolocation field (Array)
Longitude	[n][10]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][10][2]	INT32	mapping to geolocation array
SightVector	[n][10][3]	DOUBLE	mapping to geolocation array
Altitude	[n][10]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[4200][4100]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array

Block size	

Scan Line No. is skipped along line dimension. (one per 400 lines in image data).

2.3.4.4. VNIR Band 3N Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.4-5 shows the List of data items in VNIR Band 3N Swath.

a) Data model: Swath
b) Object Name: VNIR_Band3N
c) Format: Table 2.3.4-5 shows the contents of Swath Object. Table 2.3.4-6 shows the format of one.

Table 2.3.4-5 List of data items in Level 1A VNIR Band 3N Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.4-6 Format of data items in VNIR Band 3N Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][10]	DOUBLE	geolocation field (Array)
Longitude	[n][10]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][10][2]	INT32	mapping to geolocation array
SightVector	[n][10][3]	DOUBLE	mapping to geolocation array
Altitude	[n][10]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[4200][4100]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array

Block size	400 410

Scan Line No. is skipped along line dimension. (one per 400 lines in image data).

2.3.4.5. VNIR Band 3B Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.4-7 shows the List of data items in VNIR Band 3B Swath.

a) Data model: Swath
b) Object Name: VNIR_Band3B
c) Format: Table 2.3.4-7 shows the contents of Swath Object. Table 2.3.4-8 shows the format of one.

Table 2.3.4-7 List of data items in Level 1A VNIR Band 3B Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

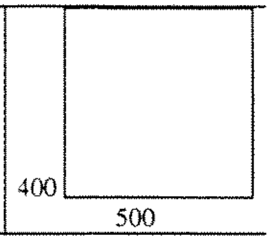
Table 2.3.4-8 Format of data items in VNIR Band 3B Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][10]	DOUBLE	geolocation field (Array)
Longitude	[n][10]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][10][2]	INT32	mapping to geolocation Array
SightVector	[n][10][3]	DOUBLE	mapping to geolocation Array
Altitude	[n][10]	DOUBLE	mapping to geolocation Array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation Table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation Table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation Table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation Table
ObservationTime	[n]	DOUBLE	mapping to geolocation Table
ImageData	[4600][5000]	UINT8	mapping to geolocation Array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array

Block size	

Scan Line No. is skipped along line dimension. (one per 400 lines in image data).

2.3.4.6. Radiometric Correction Table

VNIR Radiometric Correction Table Group contains a series of SDS Objects through the use of the Vgroup API. Each SDS object named as follows. Characteristics of each SDS object are described later subsection.

(1) VNIR Band 1
(2) VNIR Band 2
(3) VNIR Band 3N
(4) VNIR Band 3B

Radiometric correction coefficients of

equation :

First entry in coefficients dimension is **Dv**.
vgroup name which establishes access to a Vgroup is as follows.

vgroup name: VNIR_Radiometric

2.3.4.6.1. VNIR Band 1

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_1
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[4100][2]	FLOAT

2.3.4.6.2. VNIR Band 2

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_2
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[4100][2]	FLOAT

2.3.4.6.3. VNIR Band 3N

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_3N
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[4100][2]	FLOAT

2.3.4.6.4. VNIR Band 3B

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_3B
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[5000][2]	FLOAT

2.3.4.7. VNIR Supplement Data

(1) Description

VNIR Supplement Data contain VNIR status data, calibration data, and pointing angles etc.

(2) Characteristics (TBD)

a) Data model: Vdata

b) Object Name: VNIR_Supplement

c) Class Name: VNIR_Supple_Record.*n* (*n*: Record count number)

d) Format: Each record is stored in class. Table 2.3.4-9 shows the format and the contents of Supplement Data.

Table 2.3.4-9 Format of Supplement Data (1/2)

Field Name	Variable Size	Description
Relative_Scan_No	UNIT32	Relative Scan Number
B1_DET_Temp	UINT8	Band 1 Detector Temperature
B2_DET_Temp	UINT8	Band 2 Detector Temperature
B3N_DET_Temp	UINT8	Band 3N Detector Temperature
B3B_DET_Temp	UINT8	Band 3B Detector Temperature
LAMP_A_Temp	UINT8	Calibration Lamp A Temperature
LAMP_B_Temp	UINT8	Calibration Lamp B Temperature
MON_AMP_Temp	UINT8	Monitor Amp. Temperature
PD_1_Temp	UINT8	Photodiode 1 Temperature
PD_2A_Temp	UINT8	Photodiode 2A Temperature
PD_2B_Temp	UINT8	Photodiode 2B Temperature
VSP1_Temp	UINT8	VSP 1 Temperature
VSP2_Temp	UINT8	VSP 2 Temperature
VEL_RAD_Temp	UINT8	VEL Base Plate Temperature
TELSCP_Temp1N	UINT8	Nadir Telescope Temperature 1
TELSCP_Temp2N	UINT8	Nadir Telescope Temperature 2
TELSCP_Temp3N	UINT8	Nadir Telescope Temperature 3
TELSCP_Temp1B	UINT8	Backward Telescope Temperature 1
TELSCP_Temp2B	UINT8	Backward Telescope Temperature 2
TELSCP_Temp3B	UINT8	Backward Telescope Temperature 3
PS_Vol	UINT8	VPS Lamp Power Supply Voltage
PD_1A_OUT	UINT8	Photodiode 1A Output
PD_1B_OUT	UINT8	Photodiode 1B Output
PD_2A_OUT	UINT8	Photodiode 2A Output
PD_2B_OUT	UINT8	Photodiode 2B Output
ECAL_Vol1	UINT8	Electric Calibration Voltage.1
ECAL_Vol2	UINT8	Electric Calibration Voltage.2
ECAL_Vol3	UINT8	Electric Calibration Voltage.3
ECAL_Vol4	UINT8	Electric Calibration Voltage.4
VSP1_APS_Vol+	UINT8	VSP1 APS Vol. +10V
VSP1_APS_Vol-	UINT8	VSP1 APS Vol. -10V
Ptg_Angl1	UINT8	Pointing Angle 1
Ptg_Angl2	UINT8	Pointing Angle 2
Init_E_Address1	UINT8	Initial Extract Address 1
Init_E_Address2	UINT8	Initial Extract Address 2
Platform_Pos1	UINT8	Platform Position (Z) 1
Platform_Pos2	UINT8	Platform Position (Z) 2

Table 2.3.4-9 Format of Supplement Data (2/2)

Field Name	Variable Size	Description
GAIN_SEL	UINT8	Bit-0: Band 1 Normal/High Gain Selection Bit-1: Band 1 Normal/Low Gain Selection Bit-2: Band 2 Normal/High Gain Selection Bit-3: Band 2 Normal/Low Gain Selection Bit-4: Band 3 Normal/High Gain Selection Bit-5: Band 3 Normal/Low Gain Selection Bit-6: Band 3 A/B Selection Bit-7: OPE. Optical/Electric Calibration Selection
On/Off	UINT8	Bit-0: Calibration Lamp A/B Selection Bit-1: PS1 On/Off Bit-2: PS3 On/Off Bit-3: Table Cancel On/Off Bit-4: PS4 On/Off Bit-5: TBD Bit-6: TBD Bit-7: TBD
R1	UINT8	TBD
R2	UINT8	TBD
R3	UINT8	TBD
R4	UINT8	TBD
R5	UINT8	TBD
R6	UINT8	TBD
R7	UINT8	TBD
R8	UINT8	TBD
R9	UINT8	TBD
R10	UINT8	TBD
R11	UINT8	TBD
R12	UINT8	TBD

2.3.4.8. VNIR Browse Image

(1) Description

VNIR Browse Image is compressed, using the standard features of the HDF libraries. As Browse images are divided from Level 1A Data Product in "ASTER Level 1 Data Product Specification (science version, version 2.0)", these will be stored in another HDF file as a subset of Level 1A data products in next version.

(2) Characteristics (TBD)

a) Color Assignment: Current base line is as follows.

	B	G	R
Band No.	1	2	3N

b) Sampling Method: average sampling

c) Sampling Rate: 1/20.5

d) Format: Table 2.3.4-10 shows the format

Table 2.3.4-10 Format of Browse Image

Object Name	Dimension Size	Data Model	Compression Method	Quality Factor
VNIR_Browse	200 210	RIS24	JPEG	50

2.3.5. SWIR Group

2.3.5.1 Overview

SWIR Group contains a Vdata, and a RIS24, a series of Swath Objects through the use of the Vgroup API. Vgroup name which establishes access to a Vgroup is as follows.

vgroup name: SWIR_Group

2.3.5.2. SWIR Band 4 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.5-1 shows the List of data items in SWIR Band 4 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band4
c) Format: Table 2.3.5-1 shows the contents of Swath Object. Table 2.3.5-2 shows the format of one.

Table 2.3.5-1 List of data items in Level 1A SWIR Band 4 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-2 Format of data items in SWIR Band 4 Swath (1/2)

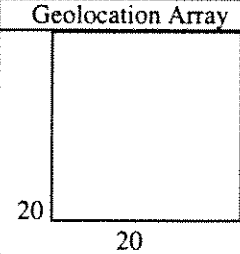
Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table

Table 2.3.5-2 Format of data items in SWIR Band 4 Swath (2/2)

Field Name	Dimension Size	Variable Type	Remarks
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.3. SWIR Band 5 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.5-3 shows the List of data items in SWIR Band 5 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band5
c) Format: Table 2.3.5-3 shows the contents of Swath Object. Table 2.3.5-4 shows the format of one.

Table 2.3.5-3 List of data items in Level 1A SWIR Band 5 Swath

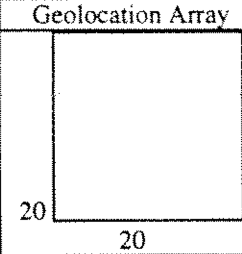
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-4 Format of data items in SWIR Band 5 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.4. SWIR Band 6 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.5-5 shows the List of data items in SWIR Band 6 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band6
c) Format: Table 2.3.5-5 shows the contents of Swath Object. Table 2.3.5-6 shows the format of one.

Table 2.3.5-5 List of data items in Level 1A SWIR Band 6 Swath

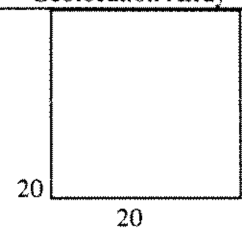
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-6 Format of data items in SWIR Band 6 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.5. SWIR Band 7 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.5-7 shows the List of data items in SWIR Band 7 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band7
c) Format: Table 2.3.5-7 shows the contents of Swath Object. Table 2.3.5-8 shows the format of one.

Table 2.3.5-7 List of data items in Level 1A SWIR Band 7 Swath

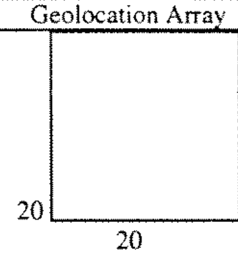
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-8 Format of data items in SWIR Band 7 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.6. SWIR Band 8 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.5-9 shows the List of data items in SWIR Band 8 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band8
c) Format: Table 2.3.5-9 shows the contents of Swath Object. Table 2.3.5-10 shows the format of one.

Table 2.3.5-9 List of data items in Level 1A SWIR Band 8 Swath

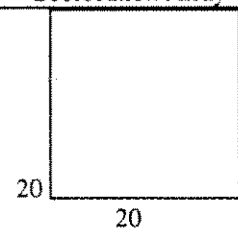
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-10 Format of data items in SWIR Band 8 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.7. SWIR Band 9 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.5-11 shows the List of data items in SWIR Band 9 Swath.

a) Data model: Swath
b) Object Name: SWIR_Band9
c) Format: Table 2.3.5-11 shows the contents of Swath Object. Table 2.3.5-12 shows the format of one.

Table 2.3.5-11 List of data items in Level 1A SWIR Band 9 Swath

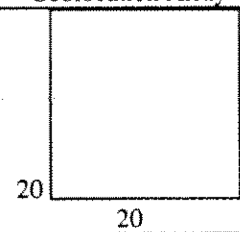
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	ParallaxOffset	3D Data Array	pixel	parallax correction
8.	Evaluation	2D Data Array	-	1: Image matching 2: using DEM 3: Interpolation
9.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
10.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
11.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
12.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
13.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
14.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.5-12 Format of data items in SWIR Band 9 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][103]	DOUBLE	geolocation field (Array)
Longitude	[n][103]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][103][2]	INT32	mapping to geolocation array
SightVector	[n][103][3]	DOUBLE	mapping to geolocation array
Altitude	[n][103]	DOUBLE	mapping to geolocation array
ParallaxOffset	[n][103][2]	DOUBLE	mapping to geolocation array
Evaluation	[n][103]	INT32	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[2100][2048]	UINT8	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 20 lines in image data).

2.3.5.8. Radiometric Correction Table

SWIR Radiometric Correction Table Group contains a series of SDS Objects through the use of the Vgroup API. Each SDS object named as follows. Characteristics of each SDS object are described later subsection.

(1) SWIR Band 4
(2) SWIR Band 5
(3) SWIR Band 6
(4) SWIR Band 7
(5) SWIR Band 8
(6) SWIR Band 9

Radiometric correction coefficients of

equation :

First entry in coefficients dimension is **Dv**.
vgroup name which establishes access to a Vgroup is as follows.

vgroup name: SWIR_Radiometric

2.3.5.8.1. SWIR Band 4

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_4
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.4.6.2. SWIR Band 5

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_5
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.8.3. SWIR Band 6

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_6
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.8.4. SWIR Band 7

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_7

c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.8.5. SWIR Band 8

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_8
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.8.6. SWIR Band 9

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_9
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[2048][2]	FLOAT

2.3.5.9. SWIR Supplement Data

(1) Description

SWIR Supplement Data contain SWIR status data, calibration data, and pointing angles etc.

(2) Characteristics (TBD)

a) Data Model: Vdata

b) Object Name: SWIR_Supplement

c) Class Name: SWIR_Supple_Record.*n* (*n*: Record count number)

d) Format: Each record is stored in class. Since SWIR Supplement Data are updated once per cycle time (4.398msec), Increment of frame number is attended on this update. Table 2.3.5-13 shows the contents of each entry. Table 2.3.5-14~18 show the format and the contents of Supplement Data in detail.

Table 2.3.5-13 Contents of Supplement Data

Frame Number	Contents of the Entries
0	all of synchronous code, frame number, and reserved field and Major Frame No. 0 & 1 (MF-0,1) from WORD#38 to WORD#53 in Table 2.3.5-14~18.
1	all of synchronous code, frame number, and reserved field and Major Frame No. 2 & 3 (MF-2,3) from WORD#38 to WORD#53 in Table 2.3.5-14~18.
2	all of synchronous code, frame number, and reserved field and Major Frame No. 4 & 5 (MF-4,5) from WORD#38 to WORD#53 in Table 2.3.5-14~18.
3	all of synchronous code, frame number, and reserved field and Major Frame No. 6 & 7 (MF-6,7) from WORD#38 to WORD#53 in Table 2.3.5-14~18.
....	write following entries repeatedly concerning above four frames.

Table 2.3.5-14 Format of Supplement Data (1/4)

Field Name	Variable Size	Description
Relative_Scan_No	UINT32	Relative Scan Number
SynchronousCode1	UINT8	Synchronous Code (6DE2B846)
SynchronousCode2	UINT8	
SynchronousCode3	UINT8	
SynchronousCode4	UINT8	
FrameNumber1	UINT8	Frame Number (sequential number from 0 to 10^{24}-1)
FrameNumber2	UINT8	
FrameNumber3	UINT8	
WORD#38	UINT16	WORD#38 MF-0: Optics monitor voltage A MF-1: Cooler current 3 MF-2: Optics monitor voltage A MF-3: Cooler current 3 MF-4: Optics monitor voltage A MF-5: Cooler current 3 MF-6: Optics monitor voltage A MF-7: Cooler current 3

Table 2.3.5-14 Format of Supplement Data (2/4)

Field Name	Variable Size	Description
WORD#39	UINT16	WORD#39 MF-0: Spare MF-1: Cooler current 4 MF-2: Spare MF-3: Cooler current 4 MF-4: Spare MF-5: Cooler current 4 MF-6: Spare MF-7: Cooler current 4
WORD#40	UINT16	WORD#40 MF-0: Optics monitor voltage B MF-1: Detector temperature (NARROW) MF-2: Optics monitor voltage B MF-3: Detector temperature (NARROW) MF-4: Optics monitor voltage B MF-5: Detector temperature (NARROW) MF-6: Optics monitor voltage B MF-7: Detector temperature (NARROW)
WORD#41	UINT16	WORD#41 MF-0: Spare MF-1: TLM/CMD circuit reference voltage 1 MF-2: Spare MF-3: TLM/CMD circuit reference voltage 1 MF-4: Spare MF-5: TLM/CMD circuit reference voltage 1 MF-6: Spare MF-7: TLM/CMD circuit reference voltage 1
WORD#42	UINT16	WORD#42 MF-0: Cooler current 1 MF-1: TLM/CMD circuit reference voltage 2 MF-2: Cooler current 1 MF-3: TLM/CMD circuit reference voltage 2 MF-4: Cooler current 1 MF-5: TLM/CMD circuit reference voltage 2 MF-6: Cooler current 1 MF-7: TLM/CMD circuit reference voltage 2
WORD#43	UINT16	WORD#43 MF-0: Cooler current 2 MF-1: TLM/CMD circuit reference voltage 3 MF-2: Cooler current 2 MF-3: TLM/CMD circuit reference voltage 3 MF-4: Cooler current 2 MF-5: TLM/CMD circuit reference voltage 3 MF-6: Cooler current 2 MF-7: TLM/CMD circuit reference voltage 3
WORD#44	UINT16	WORD#44 See Table 2.3.5-14
WORD#45	UINT16	WORD#45 MF-0: See Table 2.3.5-15 MF-1: Drive plus width MF-2: See Table 2.3.5-15 MF-3: Drive plus width MF-4: See Table 2.3.5-15 MF-5: Drive plus width MF-6: See Table 2.3.5-15 MF-7: Drive plus width

Table 2.3.5-14 Format of Supplement Data (3/4)

Field Name	Variable Size	Description
WORD#46	UINT16	WORD#46 MF-0: A/D reference voltage (Band 4) MF-1: Calibration lamp voltage A MF-2: Calibration lump temperature A MF-3: Support STR temperature 5 MF-4: Collector module temperature 1A MF-5: Electric circuit temperature 1 MF-6: Spare MF-7: Spare
WORD#47	UINT16	WORD#47 MF-0: A/D reference voltage (Band 5) MF-1: Calibration lamp voltage B MF-2: Calibration lump temperature B MF-3: Support STR temperature 6 MF-4: Collector module temperature 2A MF-5: Electric circuit temperature 2 MF-6: Spare MF-7: Spare
WORD#48	UINT16	WORD#48 MF-0: A/D reference voltage (Band 6) MF-1: Detector temperature (Wide) MF-2: Support STR temperature 1 MF-3: Support STR temperature 7 MF-4: Detector preamp/dewar temperature A MF-5: Electric circuit temperature 3A MF-6: Spare MF-7: Spare
WORD#49	UINT16	WORD#49 MF-0: A/D reference voltage (Band 7) MF-1: Monitor amplitude MF-2: Support STR temperature 2 MF-3: Support STR temperature 8 MF-4: Pointing mechanism temperature MF-5: Electric circuit temperature 4 MF-6: Spare MF-7: Spare
WORD#50	UINT16	WORD#50 MF-0: A/D reference voltage (Band 8) MF-1: Spare MF-2: Support STR temperature 3 MF-3: Support STR temperature 9 MF-4: Cooler temperature 1 MF-5: Optics monitor temperature A MF-6: Spare MF-7: Spare
WORD#51	UINT16	WORD#51 MF-0: A/D reference voltage (Band 9) MF-1: Spare MF-2: Support STR temperature 4 MF-3: Support STR temperature 10 MF-4: Cooler temperature 2 MF-5: Optics monitor temperature B MF-6: Spare MF-7: Spare

Table 2.3.5-14 Format of Supplement Data (4/4)

Field Name	Variable Size	Description
WORD#52	UINT16	WORD#52 MF-0: Drive plus number 1 MF-1: See Table 2.3.5-16 MF-2: See Table 2.3.5-16 MF-3: See Table 2.3.5-16 MF-4: See Table 2.3.5-16 MF-5: Spare MF-6: Spare MF-7: Spare
WORD#53	UINT16	WORD#53 MF-0: Drive plus number 1 MF-1: See Table 2.3.5-17 MF-2: See Table 2.3.5-17 MF-3: See Table 2.3.5-17 MF-4: See Table 2.3.5-17 MF-5: Spare MF-6: Spare MF-7: Spare
R1	UINT8	reserved
R2	UINT8	reserved

Table 2.3.5-15 WORD#44

Major Frame	Contents
0, 2, 4, 6	Bit-0: Pointing mirror encoder 1 Bit-1: Pointing mirror encoder 1 Bit-2: Pointing mirror encoder 1 Bit-3: Pointing mirror encoder 1 Bit-4: Pointing mirror encoder 1 Bit-5: Pointing mirror encoder 1 Bit-6: Pointing mirror encoder 1 Bit-7: Pointing mirror encoder 1
1, 3, 5, 7	Bit-0: Pointing mirror encoder 3 Bit-1: Mirror position status Bit-2: Mirror position status Bit-3: Mirror position limit status Bit-4: Limit ENA/DISA Bit-5: Pointing motor ENA/DISA Bit-6: Encoder on/off Bit-7: Monitor rotation CW/CCW

Table 2.3.5-16 WORD#45

Major Frame	Contents
0, 2, 4, 6	Bit-0: Thermal control circuit on/off Bit-1: CLR DRV circuit PS on/off Bit-2: Calibration circuit on/off Bit-3: Spare Bit-4: Spare Bit-5: Spare Bit-6: Spare Bit-7: Spare

Table 2.3.5-17 WORD#52 (1/2)

Major Frame	Contents
1	Bit-0: Band 4 gain status Bit-1: Band 4 gain status Bit-2: Band 5 gain status Bit-3: Band 5 gain status Bit-4: Band 6 gain status Bit-5: Band 6 gain status Bit-6: Spare Bit-7: Spare
2	Bit-0: DIG SIG PROC PWR Bit-1: TML/CMD PWR on/off Bit-2: Analog circuit power on/off Bit-3: Spare Bit-4: Spare Bit-5: Detector DRV PWR Bit-6: Pointing CIR PWR Bit-7: Spare
3	Bit-0: THER CIR PWR Bit-1: Heater 1 on/off Bit-2: Heater 2 on/off Bit-3: Heater 3 on/off Bit-4: Heater 4 on/off Bit-5: Heater 5 on/off Bit-6: Detector heater Bit-7: Spare

Table 2.3.5-17 WORD#52 (1/2)

Major Frame	Contents
4	Bit-0: Party flag status Bit-1: ERR CMD DIS status Bit-2: ERR CMD DIS status Bit-3: ERR CMD DIS status Bit-4: ERR CMD DIS status Bit-5: ERR CMD DIS status Bit-6: Spare Bit-7: Spare

Table 2.3.5-18 WORD#53

Major Frame	Contents
1	Bit-0: Band 7 gain status Bit-1: Band 7 gain status Bit-2: Band 8 gain status Bit-3: Band 8 gain status Bit-4: Band 9 gain status Bit-5: Band 9 gain status Bit-6: Spare Bit-7: Spare
2	Bit-0: Calibration lamp power on/off Bit-1: Calibration lamp A/B selection Bit-2: CAL CIR PWR on/off Bit-3: Cooler DRV CIR PWR Bit-4: Spare Bit-5: Spare Bit-6: Spare Bit-7: Spare
3	Bit-0: CLR monitor amplitude 1 status Bit-1: CLR monitor amplitude 1 status Bit-2: CLR monitor amplitude 1 status Bit-3: CLR monitor amplitude 1 status Bit-4: Detector temperature set status Bit-5: Detector temperature set status Bit-6: Spare Bit-7: Spare
4	Bit-0: Thermal control circuit on/off Bit-1: Thermal control circuit on/off Bit-2: Spare Bit-3: Spare Bit-4: Spare Bit-5: Spare Bit-6: Spare Bit-7: Spare

2.3.5.10. SWIR Browse Image

(1) Description

SWIR Browse Image is compressed, using the standard features of the HDF libraries.
As Browse images are divided from Level 1A Data Product in "ASTER Level 1 Data Product Specification (science version, version 2.0)", these will be stored in another HDF file as a subset of Level 1A data products in next version.

(2) Characteristics (TBD)

a) Color Assignment: Current base line is as follows.

	B	G	R
Band No.	4	5	9

b) Sampling Method: average sampling
c) Sampling Rate: 1/10.2
c) Format: Table 2.3.5-19 shows the format

Table 2.3.5-19 Format of Browse Image

Object Name	Dimension Size	Data Model	Compression Method	Quality Factor
SWIR_Browse	200 210	RIS24	JPEG	50

2.3.6. TIR Group

2.3.6.1 Overview

TIR Group contains a Vgroup, and a RIS24, a series of Swath Objects through the use of the Vgroup API. Vgroup name which establishes access to a Vgroup is as follows.

vgroup name: TIR_Group

2.3.6.2. TIR Band 10 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.5-1 shows the List of data items in TIR Band 10 Swath.

a) Data model: Swath
b) Object Name: TIR_Band10
c) Format: Table 2.3.6-1 shows the contents of Swath Object. Table 2.3.6-2 shows the format of one.

Table 2.3.6-1 List of data items in Level 1A TIR Band 10 Swath

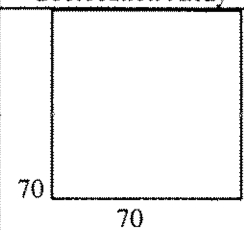
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

Table 2.3.6-2 Format of data items in TIR Band 10 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.3. TIR Band 11 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.6-3 shows the List of data items in TIR Band 11 Swath.

a) Data model: Swath
b) Object Name: TIR_Band11
c) Format: Table 2.3.6-3 shows the contents of Swath Object. Table 2.3.6-4 shows the format of one.

Table 2.3.6-3 List of data items in Level 1A TIR Band 11 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

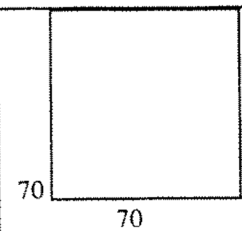
Table 2.3.6-4 Format of data items in TIR Band 11 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array

Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.4. TIR Band 12 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.6-5 shows the List of data items in TIR Band 12 Swath.

a) Data model: Swath
b) Object Name: TIR_Band12
c) Format: Table 2.3.6-5 shows the contents of Swath Object. Table 2.3.6-6 shows the format of one.

Table 2.3.6-5 List of data items in Level 1A TIR Band 12 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

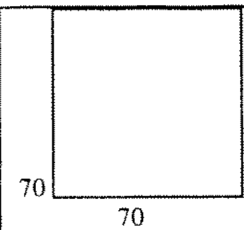
Table 2.3.6-6 Format of data items in TIR Band 12 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array

Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.5. TIR Band 13 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.6-7 shows the List of data items in TIR Band 13 Swath.

a) Data model: Swath
b) Object Name: TIR_Band13
c) Format: Table 2.3.6-7 shows the contents of Swath Object. Table 2.3.6-8 shows the format of one.

Table 2.3.6-7 List of data items in Level 1A TIR Band 13 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

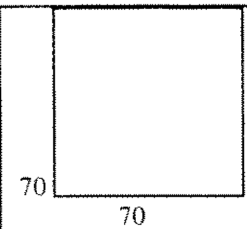
Table 2.3.6-8 Format of data items in TIR Band 13 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array

Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.6. TIR Band 14 Swath

(1) Structure
Refer to VNIR Band 1 Swath in page 2-50.

(2) Characteristics
Table 2.3.6-9 shows the List of data items in TIR Band 14 Swath.

a) Data model: Swath
b) Object Name: TIR_Band14
c) Format: Table 2.3.6-9 shows the contents of Swath Object. Table 2.3.6-10 shows the format of one.

Table 2.3.6-9 List of data items in Level 1A TIR Band 14 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	geocentric longitude -180.0 ~ +180.0
3.	SceneLineNumber	Geolocation Table	n	coordinates based on Strip Image
4.	LatticePoint	3D Data Array	pixel, line	Lattice point coordinates based on image data
5.	SightVector	3D Data Array	arcsec	line of sight vector (roll, pitch, yow) in Orbital Reference frame
6.	Altitude	2D Data Array	m	earth's surface altitude from WGS84
7.	SatellitePosition	Data Table	m	satellite position vector (x, y, z) at ECI
8.	SatelliteVelocity	Data Table	m/sec	satellite velocity vector (x, y, z) at ECI
9.	AttitudeAngle	Data Table	arcsec	satellite attitude angle (roll, pitch, yow) in Orbital Reference frame
10.	AttitudeRate	Data Table	arcsec/sec	satellite attitude angular velocity (roll, pitch, yow)
11.	ObservationTime	Data Table	msec	observation time of this lattice point [UTC]
12.	ImageData	2D Data Array	m	Level 1A spectral band image data

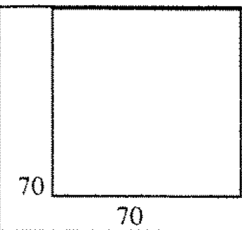
Table 2.3.6-10 Format of data items in TIR Band 14 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[n][11]	DOUBLE	geolocation field (Array)
Longitude	[n][11]	DOUBLE	geolocation field (Array)
SceneLineNumber	[n]	INT32	geolocation field (Table)
LatticePoint	[n][11][2]	INT32	mapping to geolocation array
SightVector	[n][11][3]	DOUBLE	mapping to geolocation array
Altitude	[n][11]	DOUBLE	mapping to geolocation array
SatellitePosition	[n][3]	DOUBLE	mapping to geolocation table
SatelliteVelocity	[n][3]	DOUBLE	mapping to geolocation table
AttitudeAngle	[n][3]	DOUBLE	mapping to geolocation table
AttitudeRate	[n][3]	DOUBLE	mapping to geolocation table
ObservationTime	[n]	DOUBLE	mapping to geolocation table
ImageData	[700][716]	UINT16	mapping to geolocation array

n: revised to accommodate a processing scene.

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array

Block size	

Scan Line No. is skipped along line dimension. (one per 70 lines in image data).

2.3.6.7. Radiometric Correction Table

SWIR Radiometric Correction Table Group contains a series of SDS Objects through the use of the Vgroup API. Each SDS object named as follows. Characteristics of each SDS object are described later subsection.

(1) TIR Band 10
(2) TIR Band 11
(3) TIR Band 12
(4) TIR Band 13
(5) TIR Band 14

Radiometric correction coefficients of

equation :

First entry in coefficients dimension is C_0.
vgroup name which establishes access to a Vgroup is as follows.

vgroup name: TIR_Radiometric

2.3.6.7.1. TIR Band 10

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_10
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.7.2. TIR Band 11

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_11
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.7.3. TIR Band 12

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_12
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.7.4. TIR Band 13

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_13
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.7.5. TIR Band 14

a) Data model: SDS (2 Dimension Array)
b) Object Name: Radiometric_Corr_14
c) Format: Dimension size and variable type are as follows.

Dimension Size	Variable Type
[10][3]	FLOAT

2.3.6.8. TIR Supplement Data

(1) Description

TIR Supplement Data contain TIR status data, calibration data, and pointing angles etc. TIR Supplement Data contains a single Vdata Object (Temperature) and a series of Vdata Objects (Chopper, Encoder) through the use of the Vgroup API. vgroup name which establishes access to a Vgroup is as follows.

vgroup name: TIR_Supplemant

(2) Characteristics (TBD)

Three categories in Vgroup object are shown as follows.

Supplemant Data about Temperature

a) Data Object: Vdata
b) Object Name: TIR_Supplement_Temp
c) Class Name: TIR_Supple_Temp.*n* (*n*: Record count number)
d) Format: Table 2.3.6-11 show the format and contents of Supplement Data about temparetures.

Table 2.3.6-11 Format of Supplement Data (Temperature)

Field Name	Variable Size	Description
Relative_Scan_No	UINT32	Relative Scan Number
Detector_Temp	UINT32	Detector Temperature
Black-Body_Temp1	UINT32	Temperature of Black-Body 1
Black-Body_Temp2	UINT32	Temperature of Black-Body 2
Black-Body_Temp3	UINT32	Temperature of Black-Body 3
Black-Body_Temp4	UINT32	Temperature of Black-Body 4
Black-Body_Temp5	UINT32	Temperature of Black-Body 5
Chopper_Temp1	UINT32	Temperature of Chopper 1
Chopper_Temp2	UINT32	Temperature of Chopper 2
Chopper_Temp3	UINT32	Temperature of Chopper 3
Telescope_Temp	UINT32	Temperature of Telescope
Lens_Temp	UINT32	Temperature of Lens

Supplemant Data about Chopper

a) Data Object: SDS (4 Dimension Array)
b) Object Name: TIR_Supplement_Chopper
c) Format: Table 2.3.6-12 show the format and contents of Supplement Data about chopper images.

Table 2.3.6-12 Format of Supplement Data (Chopper)

Dimension Size	Variable Type
[n][100][10][8]*	UINT8

n: revised to accommodate a processing scene.

*: chopper image is stored as record line detector component.

Supplemant Data about Encoder

a) Data Object: SDS (2 Dimension Array)
b) Object Name: TIR_Supplement_Encoder
c) Format: Table 2.3.6-13 show the format and contents of Supplement Data about encoder data.

Table 2.3.6-13 Format of Supplement Data (Chopper)

Dimension Size	Variable Type
[n][935]	UINT16

n: revised to accommodate a processing scene.

2.3.6.9. TIR Browse Image

(1) Description

TIR Browse Image is compressed, using the standard features of the HDF libraries. Converting TIR data from 16-bits format into 8-bits format subject to HDF Raster Images. As Browse images are divided from Level 1A Data Product in "ASTER Level 1 Data Product Specification (science version, version 2.0)", these will be stored in another HDF file as a subset of Level 1A data products in next version.

(2) Characteristics (TBD)

a) Color Assignment: Current base line is as follows.

	B	G	R
Band No.	10	12	14

b) Sampling Method: average sampling

c) Sampling Rate: 1/3.5

c) Format: Table 2.3.6-14 shows the format

Table 2.3.6-14 Format of Browse Image

Object Name	Dimension Size	Data Model	Compression Method	Quality Factor
TIR_Browse	200 210	RIS24	JPEG	50

3. Level 1B Data Product

3.1 Overview

Level 1B Data Products is an HDF file. Each file contains a complete 1-scene image data generated from Level 1A Data.
All of these data are stored together with Metadata and Swath Layout parts in one HDF file (see Note1).
Level 1B Product is created by performing the geometric and radiometric corrections on the original Level 1A image data, and the final result is projected onto map at full instrument resolutions. The Level 1B Data generation includes also scene registrations for SWIR and TIR data.
And furthermore for SWIR in particular, the parallax errors due to the spatial locations of all of its bands are also corrected.

Note1: As Ancillary Data and Supplement Data (VNIR, SWIR and TIR) are included in Level 1B Data Product in "ASTER Level 1 Data Product Specification (science version, version 2.0)", these will be stored in Level 1B data product HDF in next version.

Note2: Resolution is shown as follows.

Subsystem	VNIR	SWIR	TIR
Resolution	15 m	30 m	90 m

3.2 Data Structure

(1) Data Type

There are five categories of HDF data type included in Level 1B data product.
NOTE: VNIR (4 bands) and SWIR (6 bands) image data are 8-bit unsigned integer science data, and TIR (5 bands) image data are 16-bit unsigned integer science data in each categories.

(2) Data Structure

The physical data of Level 1B Data Product is shown in Figure 3.2-1.

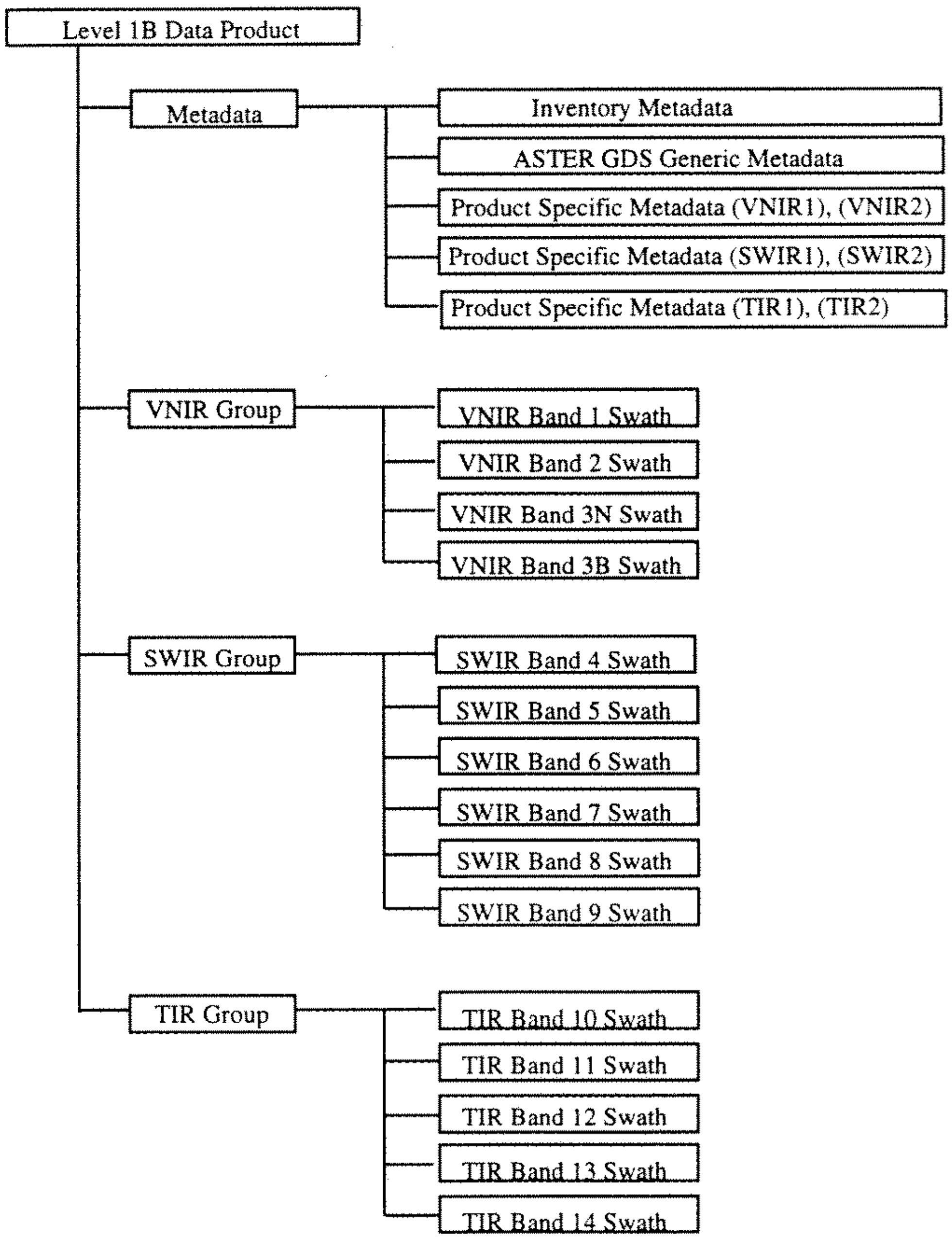


Figure 3.2-1 Physical Data of Level 1B Data Product

3.3 Data Format

3.3.1. Metadata

Level 1B Metadata consists of five Master Groups, which are
(1) Inventory Metadata
(2) ASTER GDS Generic Metadata
(3) Product Specific Metadata(VNIR1): including the attribute about band-1 and 2 data.
(4) Product Specific Metadata(VNIR2): including the attribute about band-3N and 3B data.
(5) Product Specific Metadata(SWIR1): including the attribute about band-4, 5 and 6 data.
(6) Product Specific Metadata(SWIR2): including the attribute about band-7, 8 and 9 data
(7) Product Specific Metadata(TIR1): including the attribute about band-10,11 and 12 data.
(8) Product Specific Metadata(TIR2): including the attribute about band-13 and 14 data.
About concept and definition of master groups, refer to SDP Toolkit Users Guide for the ECS Project, Appendix J.

3.3.1.1. Inventory Metadata

(1) Indexes of Objects
The object list of Inventory Metadata is shown in Table 3.3.1-1. Inventory metadata attributes apply to the whole L1B product, and are written to the HDF file attribute coremetadata.0.
Inventory metadata contains ASTER Meta-Parameters in Generic header for ASTER GDS Products (about Generic header for ASTER GDS Products, see ASTER LEVEL1 DATA PRODUCTS SPECIFICATION, science version, version2). The attributes included in inventory metadata are associated with DID311.
(In Table 3.3.1-1, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)
The objects in *Itaric* character are not authorized by Level1 WG, and will be deleted in next version.

Table 3.3.1-1 List of Objects in Inventory Metadata(1/2)

No.		**Group**/Object Name	type(*1)	Description
1		sizeMBDataGranule	double	The volume of data contained in the granule.
2		PlatformShortName	string	'AM-1' fixed.
3		InstrumentShortName	string	'ASTER' fixed.
4		**BoundingRectangle**		This block contains area coverage for a granule.
	1	WestBoundingCoordinate	double	Western-most coordinate of the scene expressed in longitude.
	2	NorthBoundingCoordinate	double	Northern-most coordinate of the scene expressed in latitude.
	3	EastBoundingCoordinate	double	Eastern-most coordinate of the scene expressed in longitude.
	4	SouthBoundingCoordinate	double	Southern-most coordinate of the scene expressed in latitude.
5		**SingleDateTime**		This contains the time of day and calendar date for a granule.
	1	TimeofDay	string	format: HHMMSSSSSSSZ
	2	CalendarDate	string	format: YYYYMMDD
6		**Review**		This block provides for dates and status as applicable for collection which are active.
	1	FutureReviewDate	string	The date of the nearest planned QA peer review in future. format: YYYYMMDD

2	ScienceReviewDate	string	The date of the last QA peer review. format: YYYYMMDD

Table 3.3.1-1 List of Objects in Inventory Metadata(2/2)

No.		**Group**/Object Name	type(*1)	Description
7		**QAStats**		This block contains measures of quality for a granule.
	1	QAPercentMissingData	double	% of missing data of the scene.
	2	QAPercentOutofBoundsData	double	% of out of bounds data of the scene.
	3	QAPercentInterpolatedData	double	% of interpolated data of the scene.
8		ReprocessingActual	string	The stating what reprocessing has been performed on this granule. {not reprocessed, reprocessed once, reprocessed twice, free text}
9		PGEVersion	string	The version of PGE
10		ProcessingLevelID	string	The classification of the science data processing level: '1B'
11		MapProjectionName	string	The name of the mapping method for the data.
12		***AdditionalAttributes***		This group contains the product specific attributes definition.
		*AdditionalAttributesContainer(n)(*2)*		This container contains the additional attributes of the product. Currently, only Day/Night Flag is contained in this container.
	1	*AdditionalAttributeName(n)(*2)*	string	Name of additional attribute: Day/Night Flag
	2	*AdditionalAttributeDescription(n)(*2)*	string	Description of additional attribute: 'The Flag indicates observation condition'
	3	*AdditionalAttributeDataType(n)(*2)*	string	Data type of additional attribute: 'STRING'
13		***InformationContent***		This group contains the product specific attribute value.
		*InformationContentContainer(n)(*2)*		This container contains the information content. Currently, only Day/Night Flag is contained in this container.
	1	*ParameterValue(n)(*2)*	string	Value of additional attribute: 'DT': observation in daytime 'NT': observation in nighttime
14		*SensorShortName*	string	The short name for sensor(s) using in generating the product: 'ASTER_VNIR','ASTER_SWIR',' ASTER_TIR','ASTER_STEREO'

NOTES:
(*1) Object types used in Metadata are
a. datetime: CCSDS A(UTC)Format
b. integer
c. double
d. string
(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

3.3.1.2. ASTER GDS Generic Metadata

(1) Indexes of Objects
The Object list of ASTER GDS Generic metadata is shown in Table 3.3.1-2. ASTER GDS Generic metadata attributes are written to the HDF file attribute productmetadata.0.
ASTER GDS Generic metadata contains ASTER Parameters in Generic Header for ASTER GDS Products (about Generic header for ASTER GDS Products, see ASTER LEVEL1 DATA PRODUCTS SPECIFICATION, science version, version2). The ASTER Parameters are ASTER GDS specific attributes, i.e. not associated with DID311.
(In Table 3.3.1-2, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)
The objects in *Itaric* character are not authorized by Level1 WG, and will be deleted in next version.

Table 3.3.1-2 List of Object in ASTER GDS Generic Metadata (1/4)

No.		**Group**/Object Name	type(*1)	Description
1		IDofASTERGDSDataGranule	string	This provides a unique identifier for location of a data granule held in ASTER GDS.
2		RecievingCenter	string	'EDOS' fixed.
3		ProcessingCenter	string	'ASTER-GDS' fixed.
4		GenerationDateandTime	datetime	Generation date and time of this Level1B product.
5		**PointingAngles**		Specification of the pointing angles of ASTER sensors.
		PointingAnglesContainer(n)(*2)		n = number of sensors
	1	SensorName(n)(*2)	string	'VNIR' or 'SWIR' or 'TIR'
	2	PointingAngle(n)(*2)	double	pointing angle in degrees
	3	SettingTimeofPointing(n)(*2)	datetime	YYYY-MM-DDThh:mm:ssZ
6		**GainInformation**		The information of the gain level.
		GainInformationContainer(n)(*2)		This container contains the level of the data acquisition gain for VNIR and SWIR.
	1	Gain(n)(*2)	string	(Band Number, Band Gain) where , Band Number: '01','02','3N','3B','04','05','06','07','08','09' Band Gain: for VNIR: 'HGH': high gain 'NOR': normal gain 'LOW': low gain for SWIR: 'HGH': high gain 'NOR': normal gain 'LO1': low gain 1 'LO2': low gain 2 when data is not acquired or doesn't exist: 'OFF'
7		**CalibrationInformation**		Calibration information used to generate the geometric and radiometric correction tables.

Table 3.3.1-2 List of Object in ASTER GDS Generic Metadata (2/4)

No.			Group/Object Name	type(*1)	Description
7	1		GeometricDBversion	string	The version information of the geometric correction data. (Version, Issuance date, Comments)
	2		RadiometricDBversion	string	The version information of the radiometric correction data. (Version, Issuance date, Comments)
8			**DataQuality**		The information about the quality of this product.
	1		**CloudCoverage**		The information about the cloud coverage of the scene
		1	SceneCloudCoverage	integer	The percentage of cloud coverage for the whole scene.
		2	QuadrantCloudCoverage	integer	The percentages for 4 quarters of a scene in the order of: upper left -> upper right -> lower left -> lower right
9			SourceDataProduct	string	The information about the input data used for generating this Level-1B product. (DataID, GenDT, Datatyp) where, DataID: ID of ASTER GDS Data granule. GenDT: Generation date and time. Datatyp: Data type, 'PDS' or 'EDS'
10			**InstrumentInformation**		The information about sensors used to acquire data.
	1		ASTEROperationMode	string	The types of ASTER operation. 'OBSERVATION' or 'CALIBRATION' or 'TEST'
	2		**ObservationMode**		This group contains ASTER observation mode.
			ObservationModeContainer(n) (*2)		The container of ASTER observation mode.

		1	ASTERObservationMode(n)(*2)	string	The observation mode of each sensor group. (SGname, Observation) where, SGname : 'VNIR1' or 'VNIR2' or 'SWIR' or 'TIR' Observation : 'ON' (data is acquired) or 'OFF' (data is not acquired, or not existing in the granule)

Table 3.3.1-2 List of Object in ASTER GDS Generic Metadata (3/4)

No.		Parameter Name	type(*1)	Description
10	3	ProcessedBands	string	The status of all bands during observation. Format : set of flags described as 2-byte string. byte = 01,02,3N~14 (band 01,02,3N~14 data is acquired.) = XX (data corresponding to its band position is not acquired) Example : Value = "01023NXX0405XXXXXXXX1011121314"
11		**SceneInformation**		The information about the scene concerning with the data granule.
	1	ASTERSceneID	integer	The scene identifier defined by path, row and view. (path, row, view) where, path: 1-233(nominal) row: 1-TBD view: 1-TBD
	2	*AOSSceneID*	string	The scene ID defined by AOS (definition: TBD).
	3	OrbitNumber	integer	The orbit number of the satellite, when data is acquired.
	4	RecurrentCycleNumber	integer	The satellite recurrent cycle number and the revolution number in the cycle. (cycle No., revolution No.) where, cycle: 1-260(max.) revolution: 1-233(nominal)
	5	FlyingDirection	string	The satellite flight direction when observation is done. 'AS': ascending direction. 'DE': descending direction.
	6	SolarDirection	double	The sun direction as seen from the scene center. (az, el) where, az: azimuth angle in degree. 0.0 <= az < 360.0 measured eastward from North. el: elevation angle in degree. -90.0 <= el <= 90.0

7	SpatialResolution	integer	The nominal spatial resolutions of VNIR, SWIR and TIR (unit : meter). (resolution of VNIR, resolution of SWIR, resolution of TIR)

Table 3.3.1-2 List of Object in ASTER GDS Generic Metadata (4/4)

No.			Parameter Name	type(*1)	Description
12			***SceneCoordinates***		This group contains the information of coordinates of the scene.
	1		***SceneCoord***		
			*SceneCoordContainer(n)(*2)*		The container of the scene coordinates, in the order of: upper left -> upper right -> lower left -> lower right
		1	*FourCornersLongandLat(n)(*2)*	double	Longitude and latitude of each corners of the full scene. unit : degree (long, lat) where, long: East longitude -180.0 <= long <= 180.0 lat: latitude -90.0 <= lat<= 90.0
	2		*CenterLongitudeandLatitude*	double	Longitude and latitude of the scene center. unit : degree (long, lat) where, long: East longitude -180.0 <= long <= 180.0 lat: latitude -90.0 <= lat <= 90.0
	3		***QuadSceneCoord***		
			*QuadSceneCoordContainer(n)(*2)*		This container contains longitudes and latitudes of the quadrant scene, in the order of: upper left -> upper right -> lower left -> lower right
		1	*FourCornersLongndLatofQuad(n)(*2)*	double	Longitude and latitude of 4 corners of the each quadrant, in the order of: upper left -> upper right -> lower left -> lower right ((long, lat)*4) where, long: East longitude (degree) -180.0 <= long <= 180.0 lat: latitude (degree) -90.0 <= lat <= 90.0
13			*IDofBrowseDatagranule*	string	Logical reference to the browse product.

NOTES:

(*1) Object types used in Metadata are
- a. datetime: CCSDS A(UTC)Format
- b. integer
- c. double
- d. string

(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

3.3.1.3. Product Specific Metadata(VNIR)

(1) Indexes of Objects
The Object list of Product Specific metadata(VNIR1) and Product Specific metadata(VNIR2) are shown in Table 3.3.1-3. Product Specific metadata(VNIR1) attributes (VNIRBand1Data and VNIRBand2Data Groups) are written to the HDF file attribute productmetadata.v1 and Product Specific metadata(VNIR2) attributes (VNIRBand3NData and VNIRBand3BData Groups) are written to productmetadata.v2.
Product Specific Metadata(VNIR1) and Product Specific metadata(VNIR2) include product specific attributes, i.e. not associated with DID311.
(In Table 3.3.1-3, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)
The objects in *Itaric* character are not authorized by Level1 WG, and will be changed in next version.

Table 3.3.1-3 List of Object in Level 1B Product Specific Metadata(VNIR)(1/9)

No.			Group/Object Name	type(*1)	Description
1			**VNIRBand1Data**		The information about VNIR band 1 of Level-1B
	1		ImageDataInformation1	integer	The information of VNIR band 1 image data. (npx, nln, bpp) where, npx: Number of pixels per line(4980 : nominal) nln: Number of lines in frame(4200 : nominal) bpp: Bytes per pixel (1 : fixed)
	2		**ImageStatistics1**		The statistical information about the quality of Level1B VNIR band 1 data.
		1	MinimumValue1	integer	Minimum value in this band of Level1B VNIR image data: 0 <= min. <= 255
		2	MaximumValue1	integer	Maximum value in this band of Level1B VNIR image data: 0 <= max. <= 255
		3	MeanValue1	double	Mean value in this band of Level1B VNIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue1	double	Standard deviation value in this band of Level1B VNIR image data.
		5	ModeValue1	integer	Mode value in this band of Level1B VNIR image data: 0 <= mode <= 255
		6	MedianValue1	integer	Median value in this band of Level1B VNIR image data: 0 <= med. <= 255
	3		**DataQuality1**		This group contains the information about the quality of Level1B band 1 VNIR data.

Table 3.3.1-3 List of Object in Level 1B Product Specific Metadata(VNIR)(2/9)

No.				Group/Object Name	type(*1)	Description
1	3	1		NumberofBadPixels1	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels1**		This group contains the information about bad pixels.
				ListofBadPixels1Container(n)(*2)		
			1	DirectionofBadPixel1(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP1(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP1(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP1(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel1(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector 'I' : Interpolated Data
	4			**ProcessingParameters1**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel1	string	Correction of the intertelescope error of SWIR and TIR: 'N/A' fixed.
		2		CorPara1	string	Correction of the SWIR parallax error: 'N/A' fixed.
		3		ResMethod1	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle1	double	Scene rotation angle of Level-1B Band-1 image.
		5		ProjectionParameters1	double	Parameters used in GCTP Map projection.
		6		*UTMZoneCode1*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).
		7		*SpheroidCode1*	integer	Spheroid code used in processing.

Table 3.3.1-3 List of Object in Level 1B Product Specific Metadata(VNIR)(3/9)

No.			Group/Object Name	type(*1)	Description
1	5		**UnitConversionCoeff1**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-1 image.
		1	Incl1	double	Inclination.
		2	Offset1	double	Offset : 0.0 fixed.
		3	UnSatMin1	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax1	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit1	string	Converted Unit
2			**VNIRBand2Data**		The information about VNIR band 2 of level-1B.
	1		ImageDataInformation2	integer	The information of VNIR band 2 image data. (npx, nln, bpp) where, npx: Number of pixels per line(4980: nominal) nln: Number of lines in frame(4200: nominal) bpp: Bytes per pixel (1: fixed)
	2		**ImageStatistics2**		The statistical information about the quality of Level1B VNIR data.
		1	MinimumValue2	integer	Minimum value in this band of Level1B VNIR image data: 0 <= min. <= 255
		2	MaximumValue2	integer	Maximum value in this band of Level1B VNIR image data: 0 <= max. <= 255
		3	MeanValue2	double	Mean value in this band of Level1B VNIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue2	double	Standard deviation value in this band of Level1B VNIR image data.
		5	ModeValue2	integer	Mode value in this band of Level1B VNIR image data: 0 <= mode <= 255
		6	MedianValue2	integer	Median value in this band of Level1B VNIR image data: 0 <= med. <= 255
	3		**DataQuality2**		This group contains the information about the quality of Level1B VNIR data.

Table 3.3.1-3 List of Object in Level 1B Product Specific Metadata(VNIR)(4/9)

No.				Group/Object Name	type(*1)	Description
2	3	1		NumberofBadPixels2	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels2**		This group contains the information about bad pixels.
				ListofBadPixels2Container(n)(*2)		
			1	DirectionofBadPixel2(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP2(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP2(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP2(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel2(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector 'I' : Interpolated Data
	4			**ProcessingParameters2**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel2	string	Correction of the intertelescope error of SWIR and TIR: 'N/A' fixed.
		2		CorPara2	string	Correction of the SWIR parallax error: 'N/A' fixed.
		3		ResMethod2	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle2	double	Scene rotation angle of Level-1B Band-2 image.
		5		ProjectionParameters2	double	Parameters used in GCTP Map projection.
		6		*UTMZoneCode2*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).
		7		*SpheroidCode2*	integer	Spheroid code used in processing.

5		**UnitConversionCoeff2**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-2 image.

Table 3.3.1-3 List of Object in Level 1B Product Specific Metadata(VNIR)(5/9)

No.			Group/Object Name	type(*1)	Description
2	5	1	Incl2	double	Inclination.
		2	Offset2	double	Offset : 0.0 fixed.
		3	UnSatMin2	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax2	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit2	string	Converted Unit
3			**VNIRBand3NData**		The information about VNIR band 3N of level-1B.
	1		ImageDataInformation3N	integer	The information of VNIR band 1 image data. (npx, nln, bpp) where, npx: Number of pixels per line(4980: nominal) nln: Number of lines in frame(4200: nominal) bpp: Bytes per pixel (1: fixed)
	2		**ImageStatistics3N**		The statistical information about the quality of Level1B VNIR data.
		1	MinimumValue3N	integer	Minimum value in this band of Level1B VNIR image data: 0 <= min. <= 255
		2	MaximumValue3N	integer	Maximum value in this band of Level1B VNIR image data: 0 <= max. <= 255
		3	MeanValue3N	double	Mean value in this band of Level1B VNIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue3N	double	Standard deviation value in this band of Level1B VNIR image data.
		5	ModeValue3N	integer	Mode value in this band of Level1B VNIR image data: 0 <= mode <= 255
		6	MedianValue3N	integer	Median value in this band of Level1B VNIR image data: 0 <= med. <= 255
	3		**DataQuality3N**		This group contains the information about the quality of Level1B VNIR data.

Table 3.3.1-3 List of Object in Level 1B Product Specific Metadata(VNIR)(6/9)

No.				Group/Object Name	type(*1)	Description
3	3	1		NumberofBadPixels3N	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels3N**		This group contains the information about bad pixels.
				ListofBadPixels3NContainer(n)(*2)		
			1	DirectionofBadPixel3N(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP3N(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP3N(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP3N(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel3N(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector 'I' : Interpolated Data
	4			**ProcessingParameters3N**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel3N	string	Correction of the intertelescope error of SWIR and TIR: 'N/A' fixed.
		2		CorPara3N	string	Correction of the SWIR parallax error: 'N/A' fixed.
		3		ResMethod3N	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle3N	double	Scene rotation angle of Level-1B Band-3N image.
		5		ProjectionParameters3N	double	Parameters used in GCTP Map projection.
		6		*UTMZoneCode3N*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).
		7		*SpheroidCode3N*	integer	Spheroid code used in processing.

5	**UnitConversionCoeff3N**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-3N image.

Table 3.3.1-3 List of Object in Level 1B Product Specific Metadata(VNIR)(7/9)

No.			Group/Object Name	type(*1)	Description
3	5	1	Incl3N	double	Inclination.
		2	Offset3N	double	Offset : 0.0 fixed.
		3	UnSatMin3N	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax3N	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit3N	string	Converted Unit
4			**VNIRBand3BData**		The information about VNIR band 3B of Level-1B.
	1		ImageDataInformation3B	integer	The information of VNIR band 3B image data. (npx, nln, bpp) where, npx: Number of pixels per line(4980 : nominal) nln: Number of lines in frame(4200 : nominal) bpp: Bytes per pixel (1 : fixed)
	2		**InitialExtractAddress**	integer	The extract address of the first available pixel in each refreshing cycle of VNIR band-3B image data. Since, there are as many as 9 refreshing cycles in a frame data (nominal = 9 for a 9.5 sec frame), there extract addresses will form a list consisting of 9 elements. (ExtrAd-1, ExtrAd-2, ..., ExtrAd-nrc) ExtrAd : 0-899
	3		**ImageStatistics3B**		The statistical information about the quality of Level1B VNIR data.
		1	MinimumValue3B	integer	Minimum value in this band of Level1B VNIR image data: 0 <= min. <= 255
		2	MaximumValue3B	integer	Maximum value in this band of Level1B VNIR image data: 0 <= max. <= 255
		3	MeanValue3B	double	Mean value in this band of Level1B VNIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue3B	double	Standard deviation value in this band of Level1B VNIR image data.

5	ModeValue3B	integer	Mode value in this band of Level1B VNIR image data: 0 <= mode <= 255
6	MedianValue3B	integer	Median value in this band of Level1B VNIR image data: 0 <= med. <= 255

Table 3.3.1-3 List of Object in Level 1B Product Specific Metadata(VNIR)(8/9)

No.				Group/Object Name	type(*1)	Description
4	4			**DataQuality3B**		This group contains the information about the quality of Level1B VNIR data.
		1		NumberofBadPixels3B	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels3B**		This group contains the information about bad pixels.
				ListofBadPixels3BContainer(n)(*2)		
			1	DirectionofBadPixel3B(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP3B(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP3B(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP3B(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel3B(n)(*2)	string	The cause of bad data: 'M' : Data missing 'D' : Damaged Detector 'I' : Interpolated Data
	5			**ProcessingParameters3B**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel3B	string	Correction of the intertelescope error of SWIR and TIR: 'N/A' fixed.
		2		CorPara3B	string	Correction of the SWIR parallax error: 'N/A' fixed.
		3		ResMethod3B	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle3B	double	Scene rotation angle of Level-1B Band-3B image.
		5		ProjectionParameters3B	double	Parameters used in GCTP Map projection.
		6		*UTMZoneCode3B*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).
		7		*SpheroidCode3B*	integer	Spheroid code used in processing.

Table 3.3.1-3 List of Object in Level 1B Product Specific Metadata(VNIR)(9/9)

No.			Group/Object Name	type(*1)	Description
4	6		**UnitConversionCoeff3B**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-3B image.
		1	Incl3B	double	Inclination.
		2	Offset3B	double	Offset : 0.0 fixed.
		3	UnSatMin3B	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax3B	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit3B	string	Converted Unit

NOTES:
(*1) Object types used in Metadata are
a. datetime: CCSDS A(UTC)Format
b. integer
c. double
d. string
(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

3.3.1.4. Product Specific Metadata(SWIR)

(1) Indexes of Objects

The Object list of Product Specific metadata(SWIR1) and Product Specific metadata(SWIR2) are shown in Table 3.3.1-4. Product Specific metadata(SWIR1) attributes (SWIRBand4Data, SWIRBand5Data and SWIRBand6Data Groups) are written to the HDF file attribute productmetadata.s1 and Product Specific metadata(SWIR2) attributes (SWIRBand7Data, SWIRBand8Data and SWIRBand9Data Groups) are written to the HDF file attribute productmetadata.s2.

Product Specific Metadata(SWIR1) and Product Specific metadata(SWIR2) include product specific attributes, i.e. not associated with DID311.

(In Table 3.3.1-4, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)

The objects in *Itaric* character are not authorized by Level1 WG, and will be changed in next version.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(1/19)

No.			Group/Object Name	type(*1)	Description
1			**SWIRBand4Data**		The information about SWIR band 4 of Level-1B.
	1		ImageDataInformatiln4	integer	The information of SWIR band 4 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2490: nominal) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)
	2		**ImageStatistics4**		The statistical information about the quality of Level1B SWIR data.
		1	MinimumValue4	integer	Minimum value in this band of Level1B SWIR image data: 0 <= min. <= 255
		2	MaximumValue4	integer	Maximum value in this band of Level1B SWIR image data: 0 <= max. <= 255
		3	MeanValue4	double	Mean value in this band of Level1B SWIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue4	double	Standard deviation value in this band of Level1B SWIR image data.
		5	ModeValue4	integer	Mode value in this band of Level1B SWIR image data: 0 <= mode <= 255
		6	MedianValue4	integer	Median value in this band of Level1B SWIR image data: 0 <= med. <= 255

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(2/19)

No.				Group/Object Name	type(*1)	Description
1	3			**DataQuality4**		This group contains the information about the quality of Level1B SWIR data.
		1		NumberofBadPixels4	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels4**		This group contains the information about bad pixels.
				ListofBadPixels4Container(n)(*2)		
			1	DirectionofBadPixel4(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP4(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP4(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP4(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel4(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector 'I' : Interpolated Data
		3		**SWIRRegistrationQuality4**		The registration information of SWIR based on VNIR.
			1	ProcessingFlag4	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements4	integer	The number of measurements
			3	MeasurementPointNumber4	integer	The number of measurement points.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(3/19)

No.				Group/Object Name	type(*1)	Description
1	3	3	4	AverageOffset4	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset4	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
			6	Threshold4	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
		4		**ParallaxCorrectionQuality4**		The information of SWIR parallax correction.
			1	PctImageMatch4	integer	The percent of image matching used in the SWIR parallax collection processing.
			2	AvgCorrelCoef4	double	The Average Correlation Coefficient.
			3	Cthld4	double	The Correlation Threshold value.
	4			**ProcessingParameters4**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel4	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara4	string	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
		3		ResMethod4	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle4	double	Scene rotation angle of Level-1B Band-4 image.
		5		ProjectionParameters4	double	Parameters used in GCTP Map projection.

		6	*UTMZoneCode4*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).

Table 3.3.1-4 List of Object in Level1B Product Specific Metadata(SWIR)(4/19)

No.			**Group**/Object Name	type(*1)	Description
1	4	7	*SpheroidCode4*	integer	Spheroid code used in processing.
	5		**UnitConversionCoeff4**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-4 image.
		1	Incl4	double	Inclination.
		2	Offset4	double	Offset : 0.0 fixed.
		3	UnSatMin4	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax4	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit4	string	Converted Unit
2			**SWIRBand5Data**		The information about SWIR band 5 of Level-1B.
	1		ImageDataInformation5	integer	The information of SWIR band 5 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2490: nominal) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)
	2		**ImageStatistics5**		The statistical information about the quality of Level1B SWIR data.
		1	MinimumValue5	integer	Minimum value in this band of Level1B SWIR image data: 0 <= min. <= 255
		2	MaximumValue5	integer	Maximum value in this band of Level1B SWIR image data: 0 <= max. <= 255
		3	MeanValue5	double	Mean value in this band of Level1B SWIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue5	double	Standard deviation value in this band of Level1B SWIR image data.
		5	ModeValue5	integer	Mode value in this band of Level1B SWIR image data: 0 <= mode <= 255
		6	MedianValue5	integer	Median value in this band of Level1B SWIR image data: 0 <= med. <= 255
	3		**DataQuality5**		This group contains the information about the quality of Level1B SWIR data.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(5/19)

No.				Group/Object Name	type(*1)	Description
2	3	1		NumberofBadPixels5	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels5**		This group contains the information about bad pixels.
				ListofBadPixels5Container(n)(*2)		
			1	DirectionofBadPixel5(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP5(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP5(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP5(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel5(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector 'I' : Interpolated Data
		3		**SWIRRegistrationQuality5**		The registration information of SWIR based on VNIR.
			1	ProcessingFlag5	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements5	integer	The number of measurements
			3	MeasurementPointNumber5	integer	The number of measurement points.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(6/19)

No.				Group/Object Name	type(*1)	Description
2	3	3	4	AverageOffset5	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset5	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
			6	Threshold5	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
		4		**ParallaxCorrectionQuality5**		The information of SWIR parallax correction.
			1	PctImageMatch5	integer	The percent of image matching used in the SWIR parallax collection processing.
			2	AvgCorrelCoef5	double	The Average Correlation Coefficient.
			3	Cthled5	double	The Correlation Threshold value.
	4			**ProcessingParameters5**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel5	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara5	string	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
		3		ResMethod5	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle5	double	Scene rotation angle of Level-1B Band-5 image.
		5		ProjectionParameters5	double	Parameters used in GCTP Map projection.

		6	*UTMZoneCode5*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).

Table 3.3.1-4 List of Object in Level1B Product Specific Metadata(SWIR)(7/19)

No.			**Group**/Object Name	type(*1)	Description
2	4	7	*SpheroidCode5*	integer	Spheroid code used in processing.
	5		**UnitConversionCoeff5**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-5 image.
		1	Incl5	double	Inclination.
		2	Offset5	double	Offset : 0.0 fixed.
		3	UnSatMin5	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax5	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit5	string	Converted Unit
3			**SWIRBand6Data**		The information about SWIR band 6 of Level-1B.
	1		ImageDataInformation6	integer	The information of SWIR band 5 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2490: nominal) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)
	2		**ImageStatistics6**		The statistical information about the quality of Level1B SWIR data.
		1	MinimumValue6	integer	Minimum value in this band of Level1B SWIR image data: 0 <= min. <= 255
		2	MaximumValue6	integer	Maximum value in this band of Level1B SWIR image data: 0 <= max. <= 255
		3	MeanValue6	double	Mean value in this band of Level1B SWIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue6	double	Standard deviation value in this band of Level1B SWIR image data.
		5	ModeValue6	integer	Mode value in this band of Level1B SWIR image data: 0 <= mode <= 255
		6	MedianValue6	integer	Median value in this band of Level1B SWIR image data: 0 <= med. <= 255
	3		**DataQuality6**		This group contains the information about the quality of Level1B SWIR data.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(8/19)

No.				Group/Object Name	type(*1)	Description
3	3	1		NumberofBadPixels6	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels6**		This group contains the information about bad pixels.
				ListofBadPixels6Container(n)(*2)		
			1	DirectionofBadPixel6(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP6(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP6(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP6(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel6(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector 'I' : Interpolated Data
		3		**SWIRRegistrationQuality6**		The registration information of SWIR based on VNIR.
			1	ProcessingFlag6	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements6	integer	The number of measurements
			3	MeasurementPointNumber6	integer	The number of measurement points.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(9/19)

No.				Group/Object Name	type(*1)	Description
3	3	3	4	AverageOffset6	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset6	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
			6	Threshold6	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
		4		**ParallaxCorrectionQuality6**		The information of SWIR parallax correction.
			1	PctImageMatch6	integer	The percent of image matching used in the SWIR parallax collection processing.
			2	AvgCorrelCoef6	double	The Average Correlation Coefficient.
			3	Cthled6	double	The Correlation Threshold value.
	4			**ProcessingParameters6**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel6	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara6	string	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
		3		ResMethod6	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle6	double	Scene rotation angle of Level-1B Band-6 image.
		5		ProjectionParameters6	double	Parameters used in GCTP Map projection.

		6	*UTMZoneCode6*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).

Table 3.3.1-4 List of Object in Level1B Product Specific Metadata(SWIR)(10/19)

No.			Group/Object Name	type(*1)	Description
3	4	7	*SpheroidCode6*	integer	Spheroid code used in processing.
	5		**UnitConversionCoeff6**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-6 image.
		1	Incl6	double	Inclination.
		2	Offset6	double	Offset : 0.0 fixed.
		3	UnSatMin6	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax6	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit6	string	Converted Unit
4			**SWIRBand7Data**		The information about SWIR band 7 of Level-1B.
	1		ImageDataInformation7	integer	The information of SWIR band 7 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2490: nominal) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)
	2		**ImageStatistics7**		The statistical information about the quality of Level1B SWIR data.
		1	MinimumValue7	integer	Minimum value in this band of Level1B SWIR image data: 0 <= min. <= 255
		2	MaximumValue7	integer	Maximum value in this band of Level1B SWIR image data: 0 <= max. <= 255
		3	MeanValue7	double	Mean value in this band of Level1B SWIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue7	double	Standard deviation value in this band of Level1B SWIR image data.
		5	ModeValue7	integer	Mode value in this band of Level1B SWIR image data: 0 <= mode <= 255
		6	MedianValue7	integer	Median value in this band of Level1B SWIR image data: 0 <= med. <= 255
	3		**DataQuality7**		This group contains the information about the quality of Level1B SWIR data.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(11/19)

No.				Group/Object Name	type(*1)	Description
4	3	1		NumberofBadPixels7	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels7**		This group contains the information about bad pixels.
				ListofBadPixels7Container(n)(*2)		
			1	DirectionofBadPixel7(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP7(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP7(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP7(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel7(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector 'I' : Interpolated Data
		3		**SWIRRegistrationQuality7**		The registration information of SWIR based on VNIR.
			1	ProcessingFlag7	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements7	integer	The number of measurements
			3	MeasurementPointNumber7	integer	The number of measurement points.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(12/19)

No.				Group/Object Name	type(*1)	Description
4	3	3	4	AverageOffset7	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset7	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
			6	Threshold7	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
		4		**ParallaxCorrectionQuality7**		The information of SWIR parallax correction.
			1	PctImageMatch7	integer	The percent of image matching used in the SWIR parallax collection processing.
			2	AvgCorrelCoef7	double	The Average Correlation Coefficient.
			3	Cthled7	double	The Correlation Threshold value.
	4			**ProcessingParameters7**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel7	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara7	string	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
		3		ResMethod7	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle7	double	Scene rotation angle of Level-1B Band-7 image.
		5		ProjectionParameters7	double	Parameters used in GCTP Map projection.

		6	*UTMZoneCode7*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).

Table 3.3.1-4 List of Object in Level1B Product Specific Metadata(SWIR)(13/19)

No.			**Group**/Object Name	type(*1)	Description
4	4	7	*SpheroidCode7*	integer	Spheroid code used in processing.
	5		**UnitConversionCoeff7**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-7 image.
		1	Incl7	double	Inclination.
		2	Offset7	double	Offset : 0.0 fixed.
		3	UnSatMin7	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax7	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit7	string	Converted Unit
5			**SWIRBand8Data**		The information about SWIR band 8 of Level-1B.
	1		ImageDataInformation8	integer	The information of SWIR band 8 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2490: nominal) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)
	2		**ImageStatistics8**		The statistical information about the quality of Level1B SWIR data.
		1	MinimumValue8	integer	Minimum value in this band of Level1B SWIR image data: 0 <= min. <= 255
		2	MaximumValue8	integer	Maximum value in this band of Level1B SWIR image data: 0 <= max. <= 255
		3	MeanValue8	double	Mean value in this band of Level1B SWIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue8	double	Standard deviation value in this band of Level1B SWIR image data.
		5	ModeValue8	integer	Mode value in this band of Level1B SWIR image data: 0 <= mode <= 255
		6	MedianValue8	integer	Median value in this band of Level1B SWIR image data: 0 <= med. <= 255
	3		**BandDataQuality8**		This group contains the information about the quality of Level1B SWIR data.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(14/19)

No.				Group/Object Name	type(*1)	Description
5	3	1		NumberofBadPixels8	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels8**		This group contains the information about bad pixels.
				ListofBadPixels8Container(n)(*2)		
			1	DirectionofBadPixel8(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP8(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP8(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP8(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel8(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector 'I' : Interpolated Data
		3		**SWIRRegistrationQuality8**		The registration information of SWIR based on VNIR.
			1	ProcessingFlag8	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements8	integer	The number of measurements
			3	MeasurementPointNumber8	integer	The number of measurement points.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(15/19)

No.				Group/Object Name	type(*1)	Description
5	3	3	4	AverageOffset8	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset8	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
			6	Threshold8	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
		4		**ParallaxCorrectionQuality8**		The information of SWIR parallax correction.
			1	PctImageMatch8	integer	The percent of image matching used in the SWIR parallax collection processing.
			2	AvgCorrelCoef8	double	The Average Correlation Coefficient.
			3	Cthled8	double	The Correlation Threshold value.
	4			**ProcessingParameters8**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel8	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara8	string	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
		3		ResMethod8	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle8	double	Scene rotation angle of Level-1B Band-8 image.
		5		ProjectionParameters8	double	Parameters used in GCTP Map projection.

		6	*UTMZoneCode8*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).

Table 3.3.1-4 List of Object in Level1B Product Specific Metadata(SWIR)(16/19)

No.			**Group**/Object Name	type(*1)	Description
5	4	7	*SpheroidCode8*	integer	Spheroid code used in processing.
	5		**UnitConversionCoeff8**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-8 image.
		1	Incl8	double	Inclination.
		2	Offset8	double	Offset : 0.0 fixed.
		3	UnSatMin8	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax8	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit8	string	Converted Unit
6			**SWIRBand9Data**		The information about SWIR band 9 of Level-1B.
	1		**ImageDataInformation9**		The information of SWIR band 9 image data. (npx, nln, bpp) where, npx: Number of pixels per line(2490: nominal) nln: Number of lines in frame(2100: nominal) bpp: Bytes per pixel (1: fixed)
	2		**ImageStatistics9**		The statistical information about the quality of Level1B SWIR data.
		1	MinimumValue9	integer	Minimum value in this band of Level1B SWIR image data: 0 <= min. <= 255
		2	MaximumValue9	integer	Maximum value in this band of Level1B SWIR image data: 0 <= max. <= 255
		3	MeanValue9	double	Mean value in this band of Level1B SWIR image data: 0.0 <= mean <= 255.0
		4	StandardDeviationValue9	double	Standard deviation value in this band of Level1B SWIR image data.
		5	ModeValue9	integer	Mode value in this band of Level1B SWIR image data: 0 <= mode <= 255
		6	MedianValue9	integer	Median value in this band of Level1B SWIR image data: 0 <= med. <= 255
	3		**BandDataQuality9**		This group contains the information about the quality of Level1B SWIR data.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(17/19)

No.				**Group**/Object Name	type(*1)	Description
6	3	1		NumberofBadPixels9	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels9**		This group contains the information about bad pixels.
				ListofBadPixels9Container(n)(*2)		
			1	DirectionofBadPixel9(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP9(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP9(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP9(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel9(n)(*2)	string	The cause of bad data: 'Me' : Missing Even Pixel 'Mo' : Missing Odd Pixel 'D' : Damaged Detector 'I' : Interpolated Data
		3		**SWIRRegistrationQuality9**		The registration information of SWIR based on VNIR.
			1	ProcessingFlag9	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements9	integer	The number of measurements
			3	MeasurementPointNumber9	integer	The number of measurement points.

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(18/19)

No.				Group/Object Name	type(*1)	Description
6	3	3	4	AverageOffset9	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset9	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
			6	Threshold9	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
		4		**ParallaxCorrectionQuality9**		The information of SWIR parallax correction.
			1	PctImageMatch9	integer	The percent of image matching used in the SWIR parallax collection processing.
			2	AvgCorrelCoef9	double	The Average Correlation Coefficient.
			3	Cthled9	double	The Correlation Threshold value.
	4			**ProcessingParameters9**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel9	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara9	string	Correction of the SWIR parallax error: 'Corrected Parallax Error' or 'Uncorrected Parallax Error'
		3		ResMethod9	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle9	double	Scene rotation angle of Level-1B Band-9 image.
		5		ProjectionParameters9	double	Parameters used in GCTP Map projection.

		6	*UTMZoneCode9*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).

Table 3.3.1-4 List of Object in Level1B Product Specific Metadata(SWIR)(19/19)

No.			**Group**/Object Name	type(*1)	Description
6	4	7	*SpheroidCode9*	integer	Spheroid code used in processing.
	5		**UnitConversionCoeff9**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-9 image.
		1	Incl9	double	Inclination.
		2	Offset9	double	Offset : 0.0 fixed.
		3	UnSatMin9	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax9	integer	Maximum value of unsaturated pixel : 254 fixed.
		5	ConUnit9	string	Converted Unit

NOTES:
(*1) Object types used in Metadata are
a. datetime: CCSDS A(UTC)Format
b. integer
c. double
d. string
(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

3.3.1.5. Product Specific Metadata(TIR)

(1) Indexes of Objects

The Object list of Product Specific metadata(TIR1) and Product Specific metadata(TIR2) are shown in Table 3.3.1-5. Product Specific metadata(TIR1) attributes (TIRBand10Data, TIRBand11Data and TIRBnad12Data Groups) are written to the HDF file attribute productmetadata.t1 and Product Specific metadata(TIR2) attributes (TIRBand13Data and TIRBnad14Data Groups) are written to the HDF file attribute productmetadata.t2.

Product Specific Metadata(TIR1) and Product Specific Metadata(TIR2) include product specific attributes, i.e. not associated with DID311.

(In Table 3.3.1-5, group names are written in **Bold** characters. A group contains a set of objects which all have a similar theme.)

The objects in *Itaric* character are not authorized by Level1 WG, and will be changed in next version.

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(1/14)

No.			Group/Object Name	type(*1)	Description
1			**TIRBand10Data**		The information about TIR band 10 of Level-1B.
	1		ImageDataInformation10	integer	The information of TIR band 10 image data. (npx, nln, bpp) where, npx: Number of pixels per line(830: nominal) nln: Number of lines in frame(700: nominal) bpp: Bytes per pixel (2: fixed)
	2		**ImageStatistics10**		The statistical information about the quality of Level1B TIR data.
		1	MinimumValue10	integer	Minimum value in this band of Level1B TIR image data: 0 <= min. <= TBD
		2	MaximumValue10	integer	Maximum value in this band of Level1B TIR image data: 0 <= max. <= TBD
		3	MeanValue10	double	Mean value in this band of Level1B TIR image data: 0.0 <= mean <= TBD
		4	StandardDeviationValue10	double	Standard deviation value in this band of Level1B TIR image data.
		5	ModeValue10	integer	Mode value in this band of Level1B TIR image data: 0 <= mode <= TBD
		6	MedianValue10	integer	Median value in this band of Level1B TIR image data: 0 <= med. <= TBD
	3		**DataQuality10**		This group contains the information about the quality of Level1B TIR data.

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(2/14)

No.				Group/Object Name	type(*1)	Description
1	3	1		NumberofBadPixels10	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels10**		This group contains the information about bad pixels.
				ListofBadPixels10Container(n)(*2)		
			1	DirectionofBadPixel10(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP10(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP10(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP10(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel10(n)(*2)	string	The cause of bad data: 'M' : Missing Data 'D' : Damaged Detector 'I' : Interpolated Data
		3		**TIRRegistrationQuality10**		The registration information of TIR based on VNIR.
			1	ProcessingFlag10	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements10	integer	The number of measurements
			3	MeasurementPointNumber10	integer	The number of measurement points.

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(3/14)

No.				Group/Object Name	type(*1)	Description
1	3	3	4	AverageOffset10	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset10	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
			6	Threshold10	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
	4			**ProcessingParameters10**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel10	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara10	string	Correction of the SWIR parallax error: 'N/A' fixed.
		3		ResMethod10	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle10	double	Scene rotation angle of Level-1B Band-10 image.
		5		ProjectionParameters10	double	Parameters used in GCTP Map projection.
		6		*UTMZoneCode10*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).
		7		*SpheroidCode10*	integer	Spheroid code used in processing.
	5			**UnitConversionCoeff10**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-10 image.
		1		Incl10	double	Inclination.
		2		Offset10	double	Offset : 0.0 fixed.

		3	UnSatMin10	integer	Minimum value of unsaturated pixel : 0 fixed.

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(4/14)

No.			Group/Object Name	type(*1)	Description
1	5	4	UnSatMax9	integer	Maximum value of unsaturated pixel.
		5	ConUnit9	string	Converted Unit
2			**TIRBand11Data**		The information about TIR band 11 of Level-1B.
	1		**ImageDataInformation11**	integer	The information of TIR band 11 image data. (npx, nln, bpp) where, npx: Number of pixels per line(830: nominal) nln: Number of lines in frame(700: nominal) bpp: Bytes per pixel (2: fixed)
	2		**ImageStatistics11**		The statistical information about the quality of Level1B TIR data.
		1	MinimumValue11	integer	Minimum value in this band of Level1B TIR image data: 0 <= min. <= TBD
		2	MaximumValue11	integer	Maximum value in this band of Level1B TIR image data: 0 <= max. <= TBD
		3	MeanValue11	double	Mean value in this band of Level1B TIR image data: 0.0 <= mean <= TBD
		4	StandardDeviationValue11	double	Standard deviation value in this band of Level1B TIR image data.
		5	ModeValue11	integer	Mode value in this band of Level1B TIR image data: 0 <= mode <= TBD
		6	MedianValue11	integer	Median value in this band of Level1B TIR image data: 0 <= med. <= TBD
	3		**BandDataQuality11**		This group contains the information about the quality of Level1B TIR data.
		1	NumberofBadPixels11	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2	**ListofBadPixels11**		This group contains the information about bad pixels.
			ListofBadPixels11Container(n)(*2)		

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(5/14)

No.				Group/Object Name	type(*1)	Description
2	3	2	1	DirectionofBadPixel11(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP11(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP11(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP11(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel11(n)(*2)	string	The cause of bad data: 'M' : Missing Data 'D' : Damaged Detector 'I' : Interpolated Data
		3		**TIRRegistrationQuality11**		The registration information of TIR based on VNIR.
			1	ProcessingFlag11	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements11	integer	The number of measurements
			3	MeasurementPointNumber11	integer	The number of measurement points.
			4	AverageOffset11	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset11	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(6/14)

No.				Group/Object Name	type(*1)	Description
2	3	3	6	Threshold11	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
	4			**ProcessingParameters11**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel11	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara11	string	Correction of the SWIR parallax error: 'N/A' fixed.
		3		ResMethod11	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle11	double	Scene rotation angle of Level-1B Band-11 image.
		5		ProjectionParameters11	double	Parameters used in GCTP Map projection.
		6		*UTMZoneCode11*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).
		7		*SpheroidCode11*	integer	Spheroid code used in processing.
	5			**UnitConversionCoeff11**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-11 image.
		1		Incl11	double	Inclination.
		2		Offset11	double	Offset : 0.0 fixed.
		3		UnSatMin11	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax11	integer	Maximum value of unsaturated pixel.
		5		ConUnit11	string	Converted Unit
3				**TIRBand12Data**		The information about TIR band 12 of Level-1B.

1	ImageDataInformation12	integer	The information of TIR band 12 image data. (npx, nln, bpp) where, npx: Number of pixels per line(830: nominal) nln: Number of lines in frame(700: nominal) bpp: Bytes per pixel (2: fixed)

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(7/14)

No.				Group/Object Name	type(*1)	Description
3	2			**ImageStatistics12**		The statistical information about the quality of Level1B TIR data.
		1		MinimumValue12	integer	Minimum value in this band of Level1B TIR image data: 0 <= min. <= TBD
		2		MaximumValue12	integer	Maximum value in this band of Level1B TIR image data: 0 <= max. <= TBD
		3		MeanValue12	double	Mean value in this band of Level1B TIR image data: 0.0 <= mean <= TBD
		4		StandardDeviationValue12	double	Standard deviation value in this band of Level1B TIR image data.
		5		ModeValue12	integer	Mode value in this band of Level1B TIR image data: 0 <= mode <= TBD
		6		MedianValue12	integer	Median value in this band of Level1B TIR image data: 0 <= med. <= TBD
	3			**DataQuality12**		This group contains the information about the quality of Level1B TIR data.
		1		NumberofBadPixels12	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels12**		This group contains the information about bad pixels.
				ListofBadPixels12Container(n)(*2)		
			1	DirectionofBadPixel12(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP12(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP12(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP12(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(8/14)

No.				Group/Object Name	type(*1)	Description
3	3	2	5	CauseofBadPixel12(n)(*2)	string	The cause of bad data: 'M' : Missing Data 'D' : Damaged Detector 'I' : Interpolated Data
		3		**TIRRegistrationQuality12**		The registration information of TIR based on VNIR.
			1	ProcessingFlag12	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements12	integer	The number of measurements
			3	MeasurementPointNumber12	integer	The number of measurement points.
			4	AverageOffset12	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset12	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
			6	Threshold12	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
	4			**ProcessingParameters12**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel12	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara12	string	Correction of the SWIR parallax error: 'N/A' fixed.
		3		ResMethod12	string	Resampling Method: 'BL' or 'NN' or 'CC'

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(9/14)

No.			Group/Object Name	type(*1)	Description
3	4	4	SceneRotationAngle12	double	Scene rotation angle of Level-1B Band-12 image.
		5	ProjectionParameters12	double	Parameters used in GCTP Map projection.
		6	*UTMZoneCode12*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).
		7	*SpheroidCode12*	integer	Spheroid code used in processing.
	5		**UnitConversionCoeff12**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-12 image.
		1	Incl12	double	Inclination.
		2	Offset12	double	Offset : 0.0 fixed.
		3	UnSatMin12	integer	Minimum value of unsaturated pixel : 0 fixed.
		4	UnSatMax12	integer	Maximum value of unsaturated pixel.
		5	ConUnit12	string	Converted Unit
4			**TIRBand13Data**		The information about TIR band 13 of Level-1B.
	1		**ImageDataInformation13**	integer	The information of TIR band 13 image data. (npx, nln, bpp) where, npx: Number of pixels per line(830: nominal) nln: Number of lines in frame(700: nominal) bpp: Bytes per pixel (2: fixed)
	2		**ImageStatistics13**		The statistical information about the quality of Level1B TIR data.
		1	MinimumValue13	integer	Minimum value in this band of Level1B TIR image data: 0 <= min. <= TBD
		2	MaximumValue13	integer	Maximum value in this band of Level1B TIR image data: 0 <= max. <= TBD
		3	MeanValue13	double	Mean value in this band of Level1B TIR image data: 0.0 <= mean <= TBD
		4	StandardDeviationValue13	double	Standard deviation value in this band of Level1B TIR image data.
		5	ModeValue13	integer	Mode value in this band of Level1B TIR image data: 0 <= mode <= TBD
		6	MedianValue13	integer	Median value in this band of Level1B TIR image data: 0 <= med. <= TBD

Table 3.3.1-4 List of Object in Level 1B Product Specific Metadata(SWIR)(10/14)

No.				Group/Object Name	type(*1)	Description
4	3			**BandDataQuality13**		This group contains the information about the quality of Level1B TIR data.
		1		NumberofBadPixels13	integer	The information about bad pixels. (nmp, ndd, nelm) where, nmp: number of missing pixels. ndd: number of damaged detectors. nelm: number of elements of the next list of bad pixels.
		2		**ListofBadPixels13**		This group contains the information about bad pixels.
				ListofBadPixels13Container(n)(*2)		
			1	DirectionofBadPixel13(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP13(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP13(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP13(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel13(n)(*2)	string	The cause of bad data: 'M' : Missing Data 'D' : Damaged Detector 'I' : Interpolated Data
		3		**TIRRegistrationQuality13**		The registration information of TIR based on VNIR.
			1	ProcessingFlag13	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements13	integer	The number of measurements
			3	MeasurementPointNumber13	integer	The number of measurement points.

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(11/14)

No.				Group/Object Name	type(*1)	Description
4	3	3	4	AverageOffset13	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset13	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.
			6	Threshold13	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
	4			**ProcessingParameters13**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel13	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara13	string	Correction of the SWIR parallax error: 'N/A' fixed.
		3		ResMethod13	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle13	double	Scene rotation angle of Level-1B Band-13 image.
		5		ProjectionParameters13	double	Parameters used in GCTP Map projection.
		6		*UTMZoneCode13*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).
		7		*SpheroidCode13*	integer	Spheroid code used in processing.
	5			**UnitConversionCoeff13**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-13 image.
		1		Incl13	double	Inclination.
		2		Offset13	double	Offset : 0.0 fixed.

		3	UnSatMin13	integer	Minimum value of unsaturated pixel : 0 fixed.

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(12/14)

No.			Group/Object Name	type(*1)	Description
4	5	4	UnSatMax13	integer	Maximum value of unsaturated pixel.
		5	ConUnit13	string	Converted Unit
5			**TIRBand14Data**		The information about TIR band 14 of Level-1B.
	1		ImageDataInformation14	integer	The information of TIR band 14 image data. (npx, nln, bpp) where, npx: Number of pixels per line(830: nominal) nln: Number of lines in frame(700: nominal) bpp: Bytes per pixel (2: fixed)
	2		**ImageStatistics14**		The statistical information about the quality of Level1B TIR data.
		1	MinimumValue14	integer	Minimum value in this band of Level1B TIR image data: 0 <= min. <= TBD
		2	MaximumValue14	integer	Maximum value in this band of Level1B TIR image data: 0 <= max. <= TBD
		3	MeanValue14	double	Mean value in this band of Level1B TIR image data: 0.0 <= mean <= TBD
		4	StandardDeviationValue14	double	Standard deviation value in this band of Level1B TIR image data.
		5	ModeValue14	integer	Mode value in this band of Level1B TIR image data: 0 <= mode <= TBD
		6	MedianValue14	integer	Median value in this band of Level1B TIR image data: 0 <= med. <= TBD
	3		**DataQuality14**		This group contains the information about the quality of Level1B TIR data.
		1	NumberofBadPixels14	integer	The information about bad pixels. (nmp, nelm, ndd) where, nmp: number of missing pixels. nelm: number of elements of the next list of bad pixels. ndd: number of damaged detectors.
		2	**ListofBadPixels14**		This group contains the information about bad pixels.
			ListofBadPixels14Container(n)(*2)		

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(13/14)

No.				**Group**/Object Name	type(*1)	Description
5	3	2	1	DirectionofBadPixel14(n)(*2)	string	The direction of bad pixel segment. 'C' = cross-track 'A' = along-track
			2	BadPixelLP14(n)(*2)	integer	The line number (in cross-track segment) or the pixel number (in along-track segment) including BPS.
			3	BPSFirstLP14(n)(*2)	integer	First pixel number in cross-track segment) or first line number (in along-track segment) of BPS.
			4	BPSLastLP14(n)(*2)	integer	Last pixel number in cross-track segment) or last line number (in along-track segment) of BPS.
			5	CauseofBadPixel14(n)(*2)	string	The cause of bad data: 'M' : Missing Data 'D' : Damaged Detector 'I' : Interpolated Data
		3		**TIRRegistrationQuality14**		The registration information of TIR based on VNIR.
			1	ProcessingFlag14	integer	0: no output, because processing is impossible. 1: output is the result computed. 2: output is extracted from registration file. 4: output obtained by other method.
			2	NumberofMeasurements14	integer	The number of measurements
			3	MeasurementPointNumber14	integer	The number of measurement points.
			4	AverageOffset14	double	Average offset value. (LAOset, PAOset) where, LAOset: Line direction average offset. PAOset: Pixel direction average offset.
			5	StandardDeviationOffset14	double	Standard deviation offset value. (LSDOset, PSDOset) where, LSDOset: Line direction SD offset. PSDOset: Pixel direction SD offset.

Table 3.3.1-5 List of Object in Level 1B Product Specific Metadata(TIR)(14/14)

No.				Group/Object Name	type(*1)	Description
5	3	3	6	Threshold14	double	Threshold value. (CThld, LOThld, POThld, VOThld) where, CThld: Correction threshold LOThld: Line direction offset threshold POThld: Pixel direction offset threshold VOThld: Vector offset threshold
	4			**ProcessingParameters14**		This group contains the parameters used by Level-1B generation processing.
		1		CorIntel14	string	Correction of the intertelescope error of SWIR and TIR: 'Corrected Intertelescope Error' or 'Uncorrected Intertelescope Error'
		2		CorPara14	string	Correction of the SWIR parallax error: 'N/A' fixed.
		3		ResMethod14	string	Resampling Method: 'BL' or 'NN' or 'CC'
		4		SceneRotationAngle14	double	Scene rotation angle of Level-1B Band-14 image.
		5		ProjectionParameters14	double	Parameters used in GCTP Map projection.
		6		*UTMZoneCode14*	integer	Zone code for UTM projection (when mapping without UTM : 0 fixed).
		7		*SpheroidCode14*	integer	Spheroid code used in processing.
	5			**UnitConversionCoeff14**		This group contains the coefficients used for radiance conversion, from the pixel value of the band-14 image.
		1		Incl14	double	Inclination.
		2		Offset14	double	Offset : 0.0 fixed.
		3		UnSatMin14	integer	Minimum value of unsaturated pixel : 0 fixed.
		4		UnSatMax14	integer	Maximum value of unsaturated pixel.
		5		ConUnit14	string	Converted Unit

NOTES:

(*1) Object types used in Metadata are
- a. datetime: CCSDS A(UTC)Format
- b. integer
- c. double
- d. string

(*2) Object whose name followed by (n) has "class" attribute, it may repeat n-times.

3.3.2. VNIR Group

3.3.2.1. Overview

VNIR Group contains a series of Swath Objects through the use of the Vgroup API. Vgroup name which establishes access to a Vgroup is as follows.

vgroup name: VNIR_Group

(1) Concept of Level 1B Data Product
The Level 1B Data Product is generated for the requested map projection and the resampling method, which for this release is:
Map projection methods: Geographic (**Uniform Lat/Long**), Universal Transverse Mercator (**UTM**), Lambert Conformal Conic (**LCC**), Mercator (**Mercator**), and Polar Stereographic (**PS**).
Resampling methods: Nearest Neighbor (**NN**), Bi-Linear (**BL**), Cubic Convolution (**CC**).
For further details on projection parameters (Projection Codes, Zone Codes, and so on), please refer to the HDF-EOS User's Guide for ECS Project, June, 1996, (170-TP-005-001) and the SDP Toolkit Users Guide for the ECS Project, May, 1996, (333-CD-003-001).

3.3.2.2. VNIR Band 1 Swath

(1) Structure
A single swath contains any number of Tables and Multidimensional Arrays. There is however one type of information that is special: geolocation information. In a swath, geolocation information is stored as a series of arrays. We require that every swath contain some geolocation component. The data itself is stored in multidimensional arrays in the swath. The only limitation is that the first dimension is the Track dimension.
For the Level 1B Data Product, each Band is stored as separate Swath structure, one per geolocation object. The structure of each Swath is almost as same as the Level 1A Swath (see Figure 2.3.4-1), though the Level 1B swath consists of a 2D data array (VNIR Band 1 image data) and a series of 2D geolocation arrays only.

(2) Characteristics
Table 3.3.2-1 shows the List of data items in VNIR Swath 1 (Swath data for VNIR band 1).

a) Data model: Swath
b) Object Name: VNIR_Band1
c) Format: Table 3.3.2-1 shows the contents of Swath Object. Table 3.3.2-2 shows the format of one.

Table 3.3.2-1 List of data items in Level 1B VNIR Band 1 Swath

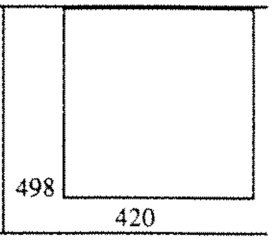
No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 1 image data

Table 3.3.2-2 Format of data items in VNIR Band 1 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[11][11]	DOUBLE	geolocation field (Array)
Longitude	[11][11]	DOUBLE	geolocation field (Array)
ImageData	[4980][4200]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array

Block size	

3.3.2.3. VNIR Band 2 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.2-3 shows the List of data items in VNIR Swath 2 (Swath data for VNIR band 2).

a) Data model: Swath
b) Object Name: VNIR_Band2
c) Format: Table 3.3.2-3 shows the contents of Swath Object. Table 3.3.2-4 shows the format of one.

Table 3.3.2-3 List of data items in Level 1B VNIR Band 2 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 2 image data

Table 3.3.2-4 Format of data items in VNIR Band 2 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[11][11]	DOUBLE	geolocation field (Array)
Longitude	[11][11]	DOUBLE	geolocation field (Array)
ImageData	[4980][4200]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	498 420

3.3.2.4. VNIR Band 3N Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.2-5 shows the List of data items in VNIR Swath 3N (Swath data for VNIR band 3N).

a) Data model: Swath
b) Object Name: VNIR_Band3N
c) Format: Table 3.3.2-5 shows the contents of Swath Object. Table 3.3.2-6 shows the format of one.

Table 3.3.2-5 List of data items in Level 1B VNIR Band 3N Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 3N image data

Table 3.3.2-6 Format of data items in VNIR Band 3N Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[11][11]	DOUBLE	geolocation field (Array)
Longitude	[11][11]	DOUBLE	geolocation field (Array)
ImageData	[4980][4200]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	498 420

3.3.2.5. VNIRBand 3B Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.2-7 shows the List of data items in VNIR Swath 3B (Swath data for VNIR band 3B).

a) Data model: Swath
b) Object Name: VNIR_Band3B
c) Format: Table 3.3.2-7 shows the contents of Swath Object. Table 3.3.2-8 shows the format of one.

Table 3.3.2-7 List of data items in Level 1B VNIR Band 3B Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 3B image data

Table 3.3.2-8 Format of data items in VNIR Band 3B Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[11][11]	DOUBLE	geolocation field (Array)
Longitude	[11][11]	DOUBLE	geolocation field (Array)
ImageData	[4980][4200]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	498 420

3.3.3. SWIR Group

3.3.3.1. Overview

SWIR Group contains a series of Swath Objects through the use of the Vgroup API. Vgroup name which establishes access to a Vgroup is as follows.

vgroup name: SWIR_Group

3.3.3.2. SWIRBand 4 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.3-1 shows the List of data items in SWIR Swath 4 (Swath data for SWIR band 4).

a) Data model: Swath
b) Object Name: SWIR_Band4
c) Format: Table 3.3.3-1 shows the contents of Swath Object. Table 3.3.3-2 shows the format of one.

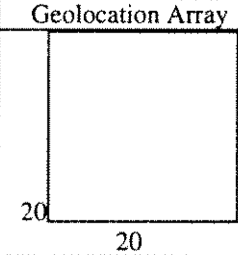
Table 3.3.3-1 List of data items in Level 1B SWIR Band 4 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 4 image data

Table 3.3.3-2 Format of data items in SWIR Band 4 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[125][106]	DOUBLE	geolocation field (Array)
Longitude	[125][106]	DOUBLE	geolocation field (Array)
ImageData	[2490][2100]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

3.3.3.3. SWIRBand 5 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.3-3 shows the List of data items in SWIR Swath 5 (Swath data for SWIR band 5).

a) Data model: Swath
b) Object Name: SWIR_Band5
c) Format: Table 3.3.3-3 shows the contents of Swath Object. Table 3.3.3-4 shows the format of one.

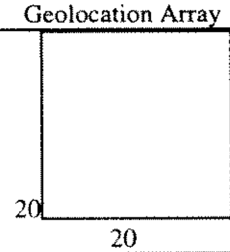
Table 3.3.3-3 List of data items in Level 1B SWIR Band 5 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 5 image data

Table 3.3.3-4 Format of data items in SWIR Band 5 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[125][106]	DOUBLE	geolocation field (Array)
Longitude	[125][106]	DOUBLE	geolocation field (Array)
ImageData	[2490][2100]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

3.3.3.4. SWIR Band 6 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.3-5 shows the List of data items in SWIR Swath 6 (Swath data for SWIR band 6).

a) Data model: Swath
b) Object Name: SWIR_Band6
c) Format: Table 3.3.3-5 shows the contents of Swath Object. Table 3.3.3-6 shows the format of one.

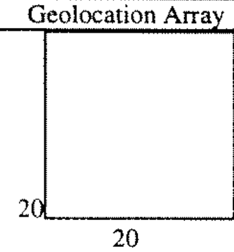
Table 3.3.3-5 List of data items in Level 1B SWIR Band 6 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 6 image data

Table 3.3.3-6 Format of data items in SWIR Band 6 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[125][106]	DOUBLE	geolocation field (Array)
Longitude	[125][106]	DOUBLE	geolocation field (Array)
ImageData	[2490][2100]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

3.3.3.5. SWIRBand 7 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.3-7 shows the List of data items in SWIR Swath 7 (Swath data for SWIR band 7).

a) Data model: Swath
b) Object Name: SWIR_Band7
c) Format: Table 3.3.3-7 shows the contents of Swath Object. Table 3.3.3-8 shows the format of one.

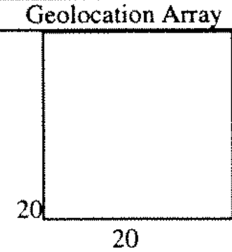
Table 3.3.4-7 List of data items in Level 1B SWIR Band 7 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 7 image data

Table 3.3.3-8 Format of data items in SWIR Band 7 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[125][106]	DOUBLE	geolocation field (Array)
Longitude	[125][106]	DOUBLE	geolocation field (Array)
ImageData	[2490][2100]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

3.3.3.6. SWIR Band 8 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.3-9 shows the List of data items in SWIR Swath 8 (Swath data for SWIR band 8).

a) Data model: Swath
b) Object Name: SWIR_Band8
c) Format: Table 3.3.3-9 shows the contents of Swath Object. Table 3.3.3-10 shows the format of one.

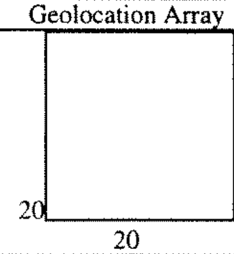
Table 3.3.4-9 List of data items in Level 1B SWIR Band 8 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 8 image data

Table 3.3.3-10 Format of data items in SWIR Band 8 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[125][106]	DOUBLE	geolocation field (Array)
Longitude	[125][106]	DOUBLE	geolocation field (Array)
ImageData	[2490][2100]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

3.3.3.7. SWIR Band 9 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.3-11 shows the List of data items in SWIR Swath 9 (Swath data for SWIR band 9).

a) Data model: Swath
b) Object Name: SWIR_Band9
c) Format: Table 3.3.3-11 shows the contents of Swath Object. Table 3.3.3-12 shows the format of one.

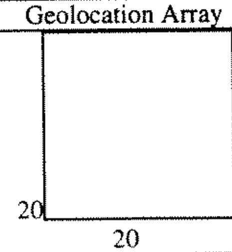
Table 3.3.3-11 List of data items in Level 1B SWIR Band 9 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 9 image data

Table 3.3.3-12 Format of data items in SWIR Band 9 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[125][106]	DOUBLE	geolocation field (Array)
Longitude	[125][106]	DOUBLE	geolocation field (Array)
ImageData	[2490][2100]	UINT8	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

3.3.4. TIR Group

3.3.4.1. Overview

TIR Group contains a series of Swath Objects through the use of the Vgroup API. Vgroup name which establishes access to a Vgroup is as follows.

vgroup name: TIR_Group

3.3.4.2. TIR Band 10 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.4-1 shows the List of data items in TIR Swath 10 (Swath data for TIR band 10).

a) Data model: Swath
b) Object Name: TIR_Band10
c) Format: Table 3.3.4-1 shows the contents of Swath Object. Table 3.3.4-2 shows the format of one.

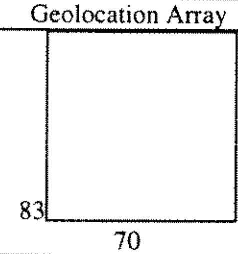
Table 3.3.4-1 List of data items in Level 1B TIR Band 10 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 10 image data

Table 3.3.4-2 Format of data items in TIR Band 10 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[11][11]	DOUBLE	geolocation field (Array)
Longitude	[11][11]	DOUBLE	geolocation field (Array)
ImageData	[830][700]	UINT16	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

3.3.4.3. TIR Band 11 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.4-3 shows the List of data items in TIR Swath 11 (Swath data for TIR band 11).

a) Data model: Swath
b) Object Name: TIR_Band11
c) Format: Table 3.3.4-3 shows the contents of Swath Object. Table 3.3.4-4 shows the format of one.

Table 3.3.4-3 List of data items in Level 1B TIR Band 11 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 11 image data

Table 3.3.4-4 Format of data items in TIR Band 11 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[11][11]	DOUBLE	geolocation field (Array)
Longitude	[11][11]	DOUBLE	geolocation field (Array)
ImageData	[830][700]	UINT16	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	83 70

3.3.4.4. TIR Band 12 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.4-5 shows the List of data items in TIR Swath 12 (Swath data for TIR band 12).

a) Data model: Swath
b) Object Name: TIR_Band12
c) Format: Table 3.3.4-5 shows the contents of Swath Object. Table 3.3.4-6shows the format of one.

Table 3.3.4-5 List of data items in Level 1B TIR Band 12 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 12 image data

Table 3.3.4-6 Format of data items in TIR Band 12 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[11][11]	DOUBLE	geolocation field (Array)
Longitude	[11][11]	DOUBLE	geolocation field (Array)
ImageData	[830][700]	UINT16	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	83 70

3.3.4.5. TIR Band 13 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.4-7 shows the List of data items in TIR Swath 13 (Swath data for TIR band 13).

a) Data model: Swath
b) Object Name: TIR_Band13
c) Format: Table 3.3.4-7 shows the contents of Swath Object. Table 3.3.4-8 shows the format of one.

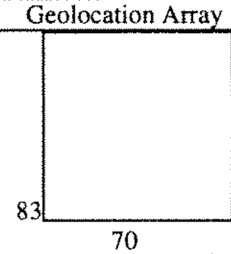
Table 3.3.4-7 List of data items in Level 1B TIR Band 13 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 13 image data

Table 3.3.4-8 Format of data items in TIR Band 13 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[11][11]	DOUBLE	geolocation field (Array)
Longitude	[11][11]	DOUBLE	geolocation field (Array)
ImageData	[830][700]	UINT16	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

3.3.4.6. TIR Band 14 Swath

(1) Structure
Refer to VNIR Swath 1 in page 3-51.

(2) Characteristics
Table 3.3.4-9 shows the List of data items in TIR Swath 14 (Swath data for TIR band 14).

a) Data model: Swath
b) Object Name: TIR_Band14
c) Format: Table 3.3.4-9 shows the contents of Swath Object. Table 3.3.4-10 shows the format of one.

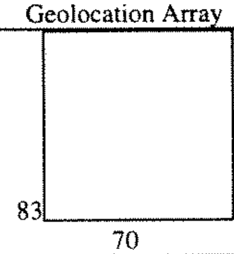
Table 3.3.4-9 List of data items in Level 1B TIR Band 14 Swath

No.	Field Name	Type	Unit	Comments
1.	Latitude	Geolocation Array	deg.	geocentric latitude -90.0 ~ +90.0
2.	Longitude	Geolocation Array	deg.	longitude -180.0 ~ +180.0
3.	ImageData	2D Data Array	N/A	Level 1B spectral band 14 image data

Table 3.3.4-10 Format of data items in TIR Band 14 Swath

Field Name	Dimension Size	Variable Type	Remarks
Latitude	[11][11]	DOUBLE	geolocation field (Array)
Longitude	[11][11]	DOUBLE	geolocation field (Array)
ImageData	[830][700]	UINT16	mapping to geolocation array

(3) Block Size
Block size is shown as follows.

Table	Geolocation Array
Block size	

Appendix A. Programming Model

A.1. Overview

This Section contains programming model for accessing Level 1A and 1B Data Products through the use of the Swath and Grid API, respectively.
The reader is directed to The HDF-EOS User's Guide for the ECS Project, Sections 7 and 8, for further detailed references.

A.2. Swath

The programming model for accessing a swath data set through the SW interface is as follows:

1. Open the file and initialize the SW interface by obtaining a file ID from a file name.
2. Open a swath data set by obtaining a swath ID from a swath name.
3. Perform desired operations on data set.
4. Close the swath data set by disposing of swath ID.

5 Terminate swath access to the file by disposing of the file ID.

To access a single swath data set in Level 1A Data Product (HDF file), the calling program must contain the following sequence of C calls:

```
file_id = SWopen(filename, DFACC_READ) ;

sw_id = SWattach(file_id, swath_name) ;

  <Optional operations>
        inquiry or subset or  read by using function as follows:
            SWnentires(sw_id, entry_code, string_buffer_size) ;
            SWinqgeofields(sw_id, field_list, rank, number_type) ;
            SWinqdatafields(sw_id, field_list, rank, number_type) ;
            SWfieldinfo(sw_id, field_name, rank, dims, number_type, dim_list
            SWreadfield(sw_id, field_name, start, stride, edge, buffer) ;
            SWdefboxregion(sw_id, corner_lon, corner_lat, mode) ;
            SWextractregion(region_id, field_name, external_made, buffer) ;

status = SWdetach(sw_id) ;

status = SWclose(file-id) ;
```

Abbreviations and Acronyms

A

AOS: ASTER Operations Segment
API: application program interface
APID: application process identifier
ASTER: Advanced Spacebone Thermal Emission and Reflection Radiometer (formerly ITIR)
ATBD: Algorithm Theoretical Basis Document

C

CCSDS: Consultative Committee on Space Data System
CDR: Critical Design Review
CDRL: Construct Data Requirement List
CDS: CCSDS day segmented time code
CSCI: computer software configration item
CUC: CCSDS unsegmented time code

D

DAAC: Distributed Active Archive Center
DID: data item description
DOUBLE: double type
DPS: Data Processing Subsystem

E

ECI: Earth centered internal
ECS: EOSDIS Core System
EDOS: EOSDIS Data and Operation System
EOSDIS: Earth Observing System Data and Information System
EPH: ephemeris data access

F

FLOAT: float type

G

GCTP: general cartographic transformation package
GDS: Ground Data System
GMT: Greenwich mean time

H

HDF: Hierarchical Data Format
HDF-EOS: an EOS proposed standard for a specialized HDF data format

I

ICD: interface control document
ID: identification
IDR: Incremental Design Review
IMS: information management system
INT8: 8-bit integer type
INT16: 16-bit integer type
IRD: interface requirements document

N

N/A: not applicable
NCSA: the National Center for Supercomputing Applications

P

PGE: Product Generation Executive
PDR: Preliminary Design Review
PDS: production data set
PGE: Product Generation Executive
PGS: Product Generation System
PGSTK: Product Generation System Toolkit
PS: Polar Stereographic

Q

QA: quality assurance

R

RIS8: 8-bit Raster type
RIS24: 24-bit Raster type

S

SCF: Science Computing Facility
SDP: science data production
SDPS: Science Data Processing Segment
SDPTK: SDP Toolkit CSCI
SOM: Space Oblique Mercator

T

TBD: To Be Determined

U

UINT8: 8-bit unsighned integer type.
UINT16: 16-bit unsighned integer type.
UINT32: 32-bit unsighned integer type
UINT64: 64-bit unsighned integer type
UTC: Coordinated Universal Time (or universal time code)
UTM: Universal Transverse Mercator

W

WGS84: World Geometric System '84

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Abbreviations and Acronyms

ACL	Access Control List
ADN	ASTER Data Network
AOS	ASTER Operations Segment
AOT	ASTER Operations Team
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
ASF	Alaska SAR Facility
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
ATC	Absolute Time Command
CCB	Configuration Control Board
CCSDS	Consultative Committee on Space Data Systems
CD	compact disk
CDR	Critical Design Review
CDRL	Contract Data Requirement List
CDS	Cell Directory Service
CEOS	Committee on Earth Observations Satellites
CERES	Clouds and Earth's Radiant Energy System
COTS	commercial off-the-shelf
CSMS	Communications and System Management Segment
DAA	Data Availability Acknowledgment
DAAC	Distributed Active Archive Center
DAN	Data Availability Notice
DAR	data acquisition request
DCE	Distributed Computing Environment
DCN	Document Change Notice
DDA	Data Delivery Acknowledgment

DDN	Data Delivery Notice
DFCD	Data Format Control Document
DID	Data Item Description
EBnet	EOSDIS Backbone Network
ECL	ECS Command Language
ECS	EOSDIS Core System
EDC	EROS Data Center
EDOS	EOS Data Operations System
EDU	Exchange Data Unit, EDOS Data Unit
EOC	Earth Operations Center
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
EROS	Earth Resources Observation System
ERSDAC	Earth Remote Sensing Data Analysis Center
ESDIS	Earth Science Data and Information System
ETR	Engineering Team Request
FDF	Flight Dynamics Facility
FOS	Flight Operations Segment
FTP	file transfer protocol
GB	Gigabyte
GDS	Ground Data System
GMT	Greenwich Mean Time
GSFC	Goddard Space Flight Center
GUI	graphical user interface
HDF	Hierarchical Data Format
I&T	integration & test
ICC	Instrument Control Center
ICD	Interface Control Document
ICOS	Instrument Control Operations Subsystem

IDR	Incremental Design Review
IOT	Instrument Operations Team
IP	International Partner, Internet Protocol
Ir1	Interim Release-1
IRD	Interface Requirement Document
ISO	International Standards Organization
IST	Instrument Support Terminal
JPL	Jet Propulsion Laboratory
KB	kilobytes
KFTP	Kerberos FTP
LAN	local area network
LaRC	Langley Research Center
LTIP	Long Term Instrument Plan
LTSP	Long Term Science Plan
MIB	management information base
MISR	Multi-Angle Imaging Spectro-Radiometer
MO&DSD	Mission Operations and Data Systems Directorate (GSFC Code 500)
MODIS	Moderate Resolution Imaging Spectroradiometer
MOM	Mission Operations Manager
MOPITT	Measurement of Pollution in the Troposphere
MOU	Memorandum of Understanding
MSFC	Marshall Space Flight Center
MTTRS	mean time to restore
NASA	National Aeronautics and Space Administration
NNTP	Network News Transfer Protocol
NSI	NASA Science Internet
NSIDC	National Snow and Ice Data Center
ODS	One Day Schedule
ORNL	Oak Ridge National Laboratory

OSF	Open Systems Foundation
OSI	Open Systems Interconnection
PDB	Project Data Base
PIP	Project Implementation Plan
PVL	Parameter Value Language
RFC	Request for Comment
ROM	read-only memory
RTCS	Relative Time Command Sequence
SAR	Synthetic Aperture Radar
SCC	Spacecraft Control Computer
SCF	Science Computing Facility
SDP	Science Data Production
SDPS	Science Data Processing Segment
SEDAC	Socio-Economic Data Analysis Center
SFDU	Standard Formatted Data Unit
SMC	System Monitoring and Control
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
STAR	Science Team Acquisition Request
STS	Short Term Schedule
TBD	to be determined
TBR	to be resolved
TBS	to be supplied
TCP	Transport Control Protocol
TDRSS	Tracking and Data Relay Satellite System
TRMM	Tropical Rainfall Measuring Mission
U.S.	United States
UDP	User Datagram Protocol

UTC	Universal Time Coordinated
VDD	Version Description Document

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