



# NATIONAL POLAR-ORBITING OPERATIONAL ENVIRONMENTAL SATELLITE SYSTEM (NPOESS)

## NPOESS to Field Terminal Interface Control Document

D34651 Rev E

**Northrop Grumman Space & Mission Systems Corporation  
One Space Park  
Redondo Beach, California 90278**

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# NATIONAL POLAR-ORBITING OPERATIONAL ENVIRONMENTAL SATELLITE SYSTEM (NPOESS)

## NPOESS to Field Terminal Interface Control Document

D34651 Rev E

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This document has been identified per the NPOESS Common Data Format Control Book – External Volume 5 Metadata, D34862-05, Appendix B as a document to be provided to the NOAA Comprehensive Large Array-data Stewardship System (CLASS) via the delivery of NPOESS Document Release Packages to CLASS.

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| A        | 02/24/2006    | Incorporation of ECRs: <ul style="list-style-type: none"> <li>o 469C, Revision A Release of D34651 NPOESS to FT ICD and Requirements Updates</li> <li>o 445B, Revision A Release of the NPOESS Common Data Format Control Book – External Volume I, D34862-01</li> <li>o 339C, Initial Release of the NPOESS Common Data Format Control Book – External Volume II – RDR Formats, D34862-02</li> <li>o 446C, Initial Releases of the NPOESS CDFCBs – Ext Volume IV, D34862-04-01 thru D34862-04-04 Parts 1 thru 4</li> </ul> <ul style="list-style-type: none"> <li>- Documented interface T_FS_FD–LB3100 to account for the start and end of pass messages sent from the SPE to the DPE</li> <li>- Updated tables and figures to ensure consistency throughout the program documents</li> <li>- Updated CCSDS format references from the FT Technical Specification to the CDFCB-X volume 7</li> <li>- Full rewrite of Section 2</li> <li>- Editorial, typographical and format updates throughout</li> </ul> | All            |
| B        | 09/10/2007    | ECR 613A: <ul style="list-style-type: none"> <li>• Updates the DPE-MAE Interfaces to be consistent with the DDS Interfaces</li> <li>• Updates the Appendices to remove the demanifested sensors,</li> <li>• Updates the common section of the ICDs,</li> <li>• Removes the Start and End of Pass Interface</li> <li>• Editorial, typographical and format updates throughout</li> <li>• Updated Appendix F by deleting products no longer delivered to FT.</li> <li>• Updated Tables 5-1 and A-1 to be more consistent with SLATE</li> <li>• Incorporation of the following ECRs:               <ul style="list-style-type: none"> <li>o 422E, Ancillary Data Architecture Implementation</li> <li>o 515B, NPOESS Restructure Baseline – De-manifested &amp; GFE Payload Perf.</li> </ul> </li> </ul>   | All            |

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|          |               | <ul style="list-style-type: none"> <li>o 560, API User 's Guide Updates and Re-Release in 2 Volumes</li> <li>o 587A, Consolidated Key Management Opscon Scenario &amp; Requirements Update</li> </ul>   |                |
| C        | 07/11/2008    | ECR 760B:<br>Incorporation of the following ECRs: <ul style="list-style-type: none"> <li>• 694A which reflects the C3S element spec deletion</li> <li>• ECR 709A: Description Clarifications to the for the NPOESS to Field Terminal ICD</li> </ul>   | All            |
| D        | 01/30/2009    | ECR 907B provides the Rev D update for this document.<br>Incorporation of the following ECRs: <ul style="list-style-type: none"> <li>• 789C: Rev B Updates to the C3S to SS ICD</li> <li>• 802G: Key Management OpsCon Scenario to Rev C and Requirements Updates, D31400-32</li> </ul>   | All            |
| E        | 12/09/2009    | ECR 1033A incorporates the following updates: <ul style="list-style-type: none"> <li>• Updated instances of IDPS to DPE and IDP to FT throughout document</li> <li>• Updated all figures to Visio</li> <li>• Section 1.0, Introduction and Section 3.0, Interfaces – added references and description to account for NPOESS CD I/F</li> <li>• Figure 3.0-1. Field Terminal Interfaces Architecture – updated figure to account for NPOESS CD (removed FTS-TBR-10525)</li> <li>• Section 3.1.1.5, SPE – NPOESS CD Interface Data Flow, new section to account for NPOESS CD</li> <li>• Table 3.2.1 2, Interface Sender and Receiver Designator – changed Aurora to Alternate for AM designator</li> <li>• Section 3.3.1.1, NPP – HRD SPE RF Interface (Physical) (Informational Only) and Section 3.3.2.1, NPOESS – HRD SPE RF Interface (Physical) – corrected antenna diameter typo from 3m to 2m</li> <li>• Section 3.3.4, SPE – DPE Interface               <ul style="list-style-type: none"> <li>o Corrected typo in title (SPES to SPE) and corrected misspelling of dependent</li> <li>o Updated interface to use file transfer in lieu of socket connection (socket connection will not allow DoD FT to meet 8500 requirements for connectivity from the SPE to the DPE and allows for the design of the DPE to match that of the NPOESS era (States 2/3) DPE implementation of the IDPS (common architecture)</li> <li>o Corrected number of satellite contacts (based on</li> </ul> </li> </ul> | All            |

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|          |               | <p>Safety Net implementation) and number of satellites in the NPOESS constellation based on NPOESS program restructure</p> <ul style="list-style-type: none"> <li>• Section 3.3.5.2, FT – MSD External Interface (Logical) – removed FTS-TBR-10525</li> <li>• Section 3.3.6.1, DPE – MAE Interface – updated text for socket connection to DDS to be via TCP/IP and removed FTS-TBR-10521</li> <li>• Section 3.3.6.2, DPE – MAE Deliverable Data Product Request (Logical) and Section 3.3.6.3, DPE – MAE Deliverable Data Product Request Status (Logical) – removed HTTP-S restriction to MAE connection, left up to user implementation. Also updated GUI connection limits to be based on user administration limits and removed FTS-TBD-10462</li> <li>• Section 3.3.6.4, DPE – MAE Deliverable Data Products (Logical) – added ARPs to the list of DPE products and added the other relevant volumes of the CDFCB-X to the list of documents included in the Data Content and Data Format section</li> <li>• Section 3.3.7.2, Field Terminal Operator – DPE – removed FTS-TBR-10525</li> <li>• Section 3.3.8, SPE – NPOESS Certificate Directory (CD) Interface – new section to account for NPOESS CD</li> <li>• Section 4.0, Key Transports – Updated all key transport text to baseline agreed to design of the key transport architecture also removed FTS-TBD-10477, FTS-TBD-10479, and FTS-TBD-10480</li> <li>• Section 4.1.1.2, NPOESS Digital Signature Public Key Transport – updated text to refer to the CDFCB-X Volume VII Part 1 for the Digital Signature Public Key Transport Application Packet format</li> <li>• Section 4.1.1.3, AES-SMD Key Transport – updated text to refer to the CDFCB-X Volume VII Part 1 for the AES-SMD Key Transport Application Packet format</li> <li>• Section 4.3, X.509v3 Certificate Structure – provided structure/format for the X.509v3 Certificate Structure an removed FTS-TBD-10478</li> <li>• Updated Appendices E and F with latest mappings as well as to modify format to improve readability and sustainment.</li> <li>• Appendix C, FTS ICD Unique Acronym List – removed acronyms documented in the NPOESS Acronym document</li> <li>• Updated appendices to reflect addition of the NPOESS CD</li> <li>• Updated verification matrix and requirements based on the</li> </ul> |                |

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|          |               | <p>update as per the Requirements Working Group</p> <ul style="list-style-type: none"> <li>• Clarification: Section 3.3.5.2, FT-MSD External Interface (Logical) - updated text description to make it clear that the retrieval of MSD from the MSDS by the DPE is not performed by the DPE software and is facilitated by the Field Terminal (be it either manual or by software means).</li> <li>• Clarification: Added footnote to Section 3.0, Interfaces - SPE section: "In order to produce NPP Data Products from the NPP HRD downlink, all supporting data (ancillary and auxiliary data) must be retrieved from the MSDS" and an additional footnote to call out the fact that the NPP HRD downlink does not contain MSD. MSDS section - added clarification of downlink (NPP/NPOESS and HRD/LRD specifiers)</li> <li>• Clarification: Section 3.1.1.1, NPOESS/NPP Satellite - SPE Interface External Data Flow - added footnote to clarify that the list of MSD is not contained in the NPP HRD downlink</li> <li>• Clarification: Section 3.1.1.2, SPE-DPE Interface External Data Flow - added footnote: NPP HRD downlink does not contain MSD, this data must be retrieved from the MSDS by the FT</li> <li>• Clarification: Section 3.3.6.6, DPE-MAE Deliverable Data Automated Notification - added clarity to Priority and Constraints to make it clear that the FT will need an email server and to configure the DPE to interact with that server for this capability to work</li> <li>• Editorial: Updated verbiage in Section 3.0, Background - FTCA section, changed "The FTCA accepts requests for and issues PKI certificates for field terminals for which it is responsible for and provides FT characteristics to the IPO" to be "The FTCA accepts PKI certificate requests for its FTs, issues PKI certificates, and provides FT characteristics to the IPO"</li> <li>• I/F Change - Section 3.3.8.1, SPE – NPOESS Certificate Directory (NCD) Interface - changed recommended sizing from 100 Mbps to 10 Mbps as even 10 Mbps is more than sufficient.</li> <li>• Removed duplication of information from Section 4.1.1, Types of Key Transports, as this information is documented in the CDFCB-X Volume VII Part 1, as referenced in the text.</li> </ul> |                |

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## 1.0 INTRODUCTION

This Interface Control Document (ICD) describes the National Polar-orbiting Operational Environmental Satellite System (NPOESS) High Rate Data (HRD) and Low Rate Data (LRD) Field Terminal (FT) interfaces. These descriptions detail the interfaces between the following spacecrafts, elements, operators, Certificate Authority, and the NPOESS Program:

- NPOESS Preparatory Project (NPP) and NPOESS spacecrafts and the Signal Processing Element (SPE)
- SPE and the Data Processor Element (DPE)
- DPE and the Mission Application Element (MAE)
- DPE and the Mission Support Data Server (MSDS)
- DPE and the Field Terminal Operator (FTO)
- SPE and the NPOESS Certificate Directory (NCD)

Interface descriptions are necessary to complete the design, development, integration, testing, deployment, and initialization of FT operations.

Note: This document should be used in conjunction with the documents listed in Table 2.2-1, ICD Compliance and Reference Documents, to design a complete field terminal.

### 1.1 Document Overview

This section describes the organization and structure of the ICD.

#### 1.1.1 Standard ICD Sections

**Section 1** Introduction – Provides a brief overview of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) and NPOESS Preparatory Project (NPP) programs, describes the document layout, and defines the interface management.

**Section 2** Applicable Documents – Lists document references and identifies as compliance or reference documents, as well as defines the Interface Control Document

(ICD) Data Package. It also establishes an order of precedence in the event of a conflict between two or more documents.

**Section 3** Interfaces – Establishes, defines, and characterizes both NPP and NPOESS interfaces.

**Section 4** Reserved

**Section 5** Interface Verification – Identifies the interface verification methodology.

**Section 6** Operational Agreements – Identifies any operational agreements, memorandums of understanding, memorandums of agreement, or technical implementation agreements affecting the implementation of any applicable interfaces in this ICD.

**Appendix A** Requirements – Provides a matrix of all associated segment-level requirements and maps them to the relating interfaces defined in this ICD.

**Appendix B** Interface and Data Mnemonic Mapping Matrix – Provides a matrix that maps all logical interfaces to the associated data flowing across the interfaces and to the associated physical interfaces.

**Appendix C** Acronym List – Provides a list of acronyms unique to this ICD only. All other acronyms are identified and listed in the NPOESS Acronyms, D35838.

**Appendix D** Reserved

### 1.1.2 Unique ICD Sections

**Appendix E** HRD/LRD Data Mnemonics – Provides a listing of the data mnemonics contained in the HRD and LRD downlinks.

**Appendix F** Deliverable Data Products – Provides a listing of the NPOESS products that can be produced by a Field Terminal.

## 1.2 Scope

This ICD establishes, defines, and characterizes the interfaces for two types of data exchange:

1. Between the NPP satellite and the HRD field terminal (Informational Only) and

between NPOESS satellites and the HRD and LRD field terminals

2. Those interfaces needed to allow the field terminal access to data when it is encrypted

This document also defines the interface description for information flowing across the respective interfaces.

The interfaces contained in this ICD may have multiple data items flowing across them; each interface references a table that defines a list of data and the data mnemonics specific to the data transferred across that interface. NPP specifications are supplied for informational and demonstration purposes. The Field Terminal Segment is supported only during the State 2 (NPP and NPOESS) and State 3 (NPOESS Only) time frames. For additional information about NPP, refer to the NPP Mission Data Format Control Book (MDFCB), GSFC 429-05-02-42, NPOESS NPP X-Band Data Format ICD, GSFC 429-04-02-28, and NPP HRD RFICD to Direct Broadcast Stations, GSFC 429-03-02-24. As the architecture evolves, additional definition and characterization of interfaces will be incorporated, as required, via subsequent releases of this document.

### **1.3 NPOESS Overview**

NPOESS collects, processes, and delivers global multi-spectral radiometry, other specialized meteorological, oceanographic, and solar-geophysical data to operational users including the National Oceanic and Atmospheric Administration/National Environmental Satellite, Data, and Information Service (NOAA/NESDIS), the Air Force Weather Agency (AFWA), the Naval Oceanographic Office (NAVOCEANO, also known as NAVO), and the Fleet Numerical Meteorology and Oceanography Center (FNMOC). The data is also provided to worldwide-deployed field terminal users, and the environmental remote sensing scientific community.

NPP is a joint program between the National Aeronautics and Space Administration (NASA) and the NPOESS Integrated Program Office (IPO). The NPOESS Preparatory Project (NPP) provides continuity of remotely sensed data measurements supporting the research of long-term change in the global climate. This is accomplished by extending the measurement series being initiated with the Earth Observing System

(EOS) Terra spacecraft Moderate Resolution Imaging SpectroRadiometer (MODIS) instrument, the EOS Aqua spacecraft Atmospheric Infrared Sounder (AIRS) instrument, and the Advanced Microwave Sounding Unit (AMSU) Programs.

The NPP and NPOESS states are composed of four and five segments, respectively. These segments are: the Space Segment (SS), Command, Control, and Communications Segment (C3S), Interface Data Processing Segment (IDPS), Launch Support Segment (LSS), and Field Terminal Segment (FTS). FTS is the NPOESS only segment

The NPOESS program has three operating states. State 1 is the initial operating Risk Reduction Phase. During State 1, the NPP satellite operates with a subset of the sensors. During State 2, both the NPP and NPOESS satellites operate during the concurrent portion of the NPP and NPOESS missions. During State 2, a subset of the applicable system requirements for the NPOESS mission are met. State 3 begins when the NPP mission is decommissioned and extends to NPOESS end of mission. During State 3, all NPOESS mission requirements are met. The NPOESS ground segment supports all three states.

#### 1.4 Interface Definition and Description

The following section provides an outline and definition of the various entries (referred to as data points) used to define and characterize each interface defined in this document.

#### X.0 Interface Title

|                           |  |
|---------------------------|--|
| <b>Interface Name</b>     | Provides the name of the interface. Generally, this is the same as the interface title.  |
| <b>Interface Mnemonic</b> | Identifies the mnemonic assigned to the interface. The mnemonic assignment is in accordance with the NPOESS Interface and Service Mnemonic Convention defined in Section 3.2, Interface Conventions. |
| <b>Description</b>        | Provides a succinct description and purpose of the interface along with any other pertinent information regarding the interface.   |

#### X.1 OPSCON Scenario

**System** This section identifies the respective system and segment scenarios pertaining to the interface. These scenarios are defined in the respective NPOESS Operations Concept (OPSCON), D31400.

## X.2 Data Transaction and Response

**Sender** The segment or entity provides the message/information transferred across this interface.

**Receiver** The segment or entity that receives the message/information transferred across this interface.

**Response** Response, if any, applicable to the application level of the interface.

## X.3 Data Content, Data Format, and Data Mnemonic

**Data Content and Data Format** Provides content and format information for data transferred via the interface. Where data content and data format are defined elsewhere, the document(s) containing this information is referenced.

**Data Mnemonic** Specifies the data mnemonic(s) assigned to the data being transferred via this interface as defined in Section 3.2.2, Data Mnemonic Definition.

## X.4 Protocol and Parameters

**Protocol** Identifies protocols involved in the data transmission. Examples of applicable logical interface protocols are:  
FTP: DPE initiates Push/Pull  
HTTP: External Internet User initiates access to web  
An example of applicable space-related physical interface protocols is:  
IEEE 488

**Parameters** For logical Interfaces:  
Identifies all parameters required in the exchange of the message/data. This relates to the parameters required to implement the transmission of the message/data, but not the parameters contained in the message itself.  
For space-related physical Interfaces:  
Identifies all the signal/link characteristics such as Bit Error Rate, Effective Isotropic Radiated Power, randomization, convolution encoding, power rating, current rating, etc.

## X.5 Data Volume and Data Rate

**Data Volume** If there are no performance requirements for an interface, then volume is not applicable for this interface data point. Individual data file sizes are specified in the applicable Data Format Control Book (DFCB). If the interface has performance requirements, (e.g., data has to be sent from sender to receiver in  $m$  seconds, or all the data needs to arrive in  $m$  seconds) then volume is the sum of all data file sizes being transferred in a specified interval. The volume would represent the minimum and maximum based upon the minimum and maximum in a given interval.

**Data Rate** Space-related physical interfaces:  
Data quantity transferred per second (such as Mb/second or MB/sec.)  
Note: Data Rate applies to space-related physical interfaces only

## X.6 Interface Characteristics

**Frequency** For logical Interfaces:  
Delivery Frequency - The number of times each data item is transferred over the interface within a given interval.  
For space-related physical Interfaces:  
Contact Frequency – The number of contacts or number of periods the physical link is active.  
Radio Frequency (RF) – The RF frequency of the signal defined in this interface.

**Timeouts** Specifies timeouts, if needed, for interfaces expecting or requiring a response from the receiver within a defined period or an error condition is generated and recovery procedures initiated (e.g., retransmissions).

**Thresholds** Defines certain interface data initiated by a trigger or threshold mechanism (e.g., warning messages sent to the operator when a queue length exceeds some threshold).

## X.7 Security

**Client Authentication Required** Describes the client authentication requirements (i.e., login, user name, password, etc.)

**Encryption Required** Specifies if encryption of the data is required and type of encryption (e.g., Advanced Encryption Standard (AES)), or if the data is source encrypted.



## X.8 Priority and Constraints

**Priority** Explicitly defines the priority, if established (i.e., based on user ID.)

**Constraints** Explicitly defines any constraints (e.g., data must be time-ordered by Virtual Channel Identification (VCID).)

## X.9 Effectivity

**Interface** Identifies each state the interface is effective.

**Effectivity** Defined as follows:

State 1-NPP Only

State 2-NPP and NPOESS

State 3-NPOESS Only

## 1.5 Interface Management

The Government NPOESS IPO Level 1 Configuration Control Board (CCB) is the Configuration Management (CM) authority for External ICDs. The Government External ICD stakeholders (e.g., NPOESS IPO, NASA, AFWA, FNMOC, NAVO, and NOAA), participate in this CCB since any change to an interface, of which, one side is outside of NPOESS control, is a Class 1 change (as defined in NPOESS System Specification, SY15-0007). Any subsequent change to external ICDs after the initial baseline requires a Class 1 Engineering Change Request (ECR) and approval by the Government NPOESS IPO Level 1 CCB.

The Northrop Grumman Space Technology (NGST) Program CCB is the CM authority for all inter-segment ICDs. The NGST CCB stakeholders (i.e., Space Segment, C3S, IDPS, etc.) participate in this CCB since any change on either side of an interface is considered to be a Class 2 change. Any subsequent change to inter-segment ICDs after the initial baseline requires a Class 2 ECR and approval by the NGST Program CCB.

After approval and release, the Configuration Management Office (CMO) performs the Data Management function and has responsibility for this ICD. ICD revisions are issued in the form of a complete document release or page changes, as applicable.

## 2.0 APPLICABLE DOCUMENTS

### 2.1 Compliance and Reference Documents

Compliance documents show conformity in fulfilling official program requirements.

Compliance documents, whether Government or non-Government officially form a part of this document to the extent specified herein.

Reference documents provide additional information that may or may not be used to define an interface or service. In those cases where they are not needed to define an interface or service, they provide supplemental or corollary information, e.g., the NPOESS Acronyms, D35838. In this example, the reference provides the definition of the acronyms, but is not needed to develop an interface or service.

Table 2.2-1, ICD Compliance and Reference Documents identifies those documents referenced throughout this ICD, specifying whether they are compliance or reference.

### 2.2 ICD Data Package

An ICD Data Package is an integrated collection of documents to complete the entire interface picture. The documents contained in an ICD Data Package either provide the necessary compliance, reference, or supplemental information needed to complete the definition and implementation of an interface or provides other interfaces needed by the user.

The ICD Data Package Documents Column of Table 2.2-1, ICD Compliance and Reference Documents, identifies those documents with an “X” which constitute the ICD Data Package for this ICD. Figure 2.2-1, ICD Data Package, is a graphical representation of the respective ICD Data Package.

**Table 2.2-1, ICD Compliance and Reference Documents**

| Document Number   | Document Title   | Brief Description  | Compliance/Reference | ICD Data Package Documents |
|-------------------|--|--|----------------------|----------------------------|
| SY15-0007         | NPOESS System Specification                                  | Defines the NPOESS and NPP system level requirements.  | Compliance           |                            |
| SY10-0004         | Field Terminal Segment Specification                         | Defines the Field Terminal segment level requirements derived from the system level requirements allocated to the Field Terminal.  | Compliance           |                            |
| D34659-01         | NPOESS Common Interfaces and Services ICD Volume I: External | Defines and characterizes the logical ancillary data and common interfaces and services for NPP and NPOESS. Interface X_NP_NU-LM0020 contains information relevant to the FTS ICD. | Reference            | X                          |
| D34862            | NPOESS Common Data Format Control Book – External (CDFCB-X)  | Consists of eight volumes that describe the data formats of all data distributed externally by the NPOESS system.  | Reference            | X                          |
| D35853            | NPOESS Data Mapping  | Defines the correspondence between the APIDs and VCIDs contained in the HRD and LRD downlinks.   | Reference            | X                          |
| D35838            | NPOESS Acronyms  | Defines the acronyms used throughout the NPOESS program.   | Reference            |                            |
| GSFC-429-05-02-42 | NPP Mission Data Format Control Book (MDFCB)                 | Describes the APID to VCID mapping and other downlink parameters associated with the NPP spacecraft.   | Reference            | X                          |
| GSFC 429-04-02-28 | NPOESS NPP X-Band Data Format ICD                            | Describes the data formats used by the NPP mission to transmit data in the X-band RF links.  | Reference            |                            |
| GSFC 429-03-02-   | NPP Spacecraft HRD RFICD to the Direct-Broadcast Stations    | Describes performance requirements and defines technical aspects of the HRD communications interface between the NPP spacecraft and Direct Broadcast Users.                        | Reference            |                            |

| Document Number | Document Title  | Brief Description   | Compliance/Reference | ICD Data Package Documents |
|-----------------|---|---|----------------------|----------------------------|
| SS23-0022       | Field Terminal Technical Specification                      | Defines technical aspects of all field terminal elements. This document is critical to the design of a field terminal and is referenced many times throughout this ICD. | Reference            | X                          |
| SS23-0060       | Field Terminal Decryption Specification                     | Describes the methodology and defines the requirements used to decrypt the HRD and LRD application packets at a field terminal.   | Reference            | X                          |
| D41044          | NPOESS Application Programming Interface (API) User's Guide | Describes the APIs used by the Data Delivery Subsystem (DDS).   | Reference            | X                          |
| D31400          | NPOESS Operations Concept                                   | Defines the operations concepts used to design the interfaces   | Reference            |                            |
| SY26-0009       | NPOESS Space Segment Specification                          | Defines the NPOESS Space Segment level requirements   | Compliance           |                            |

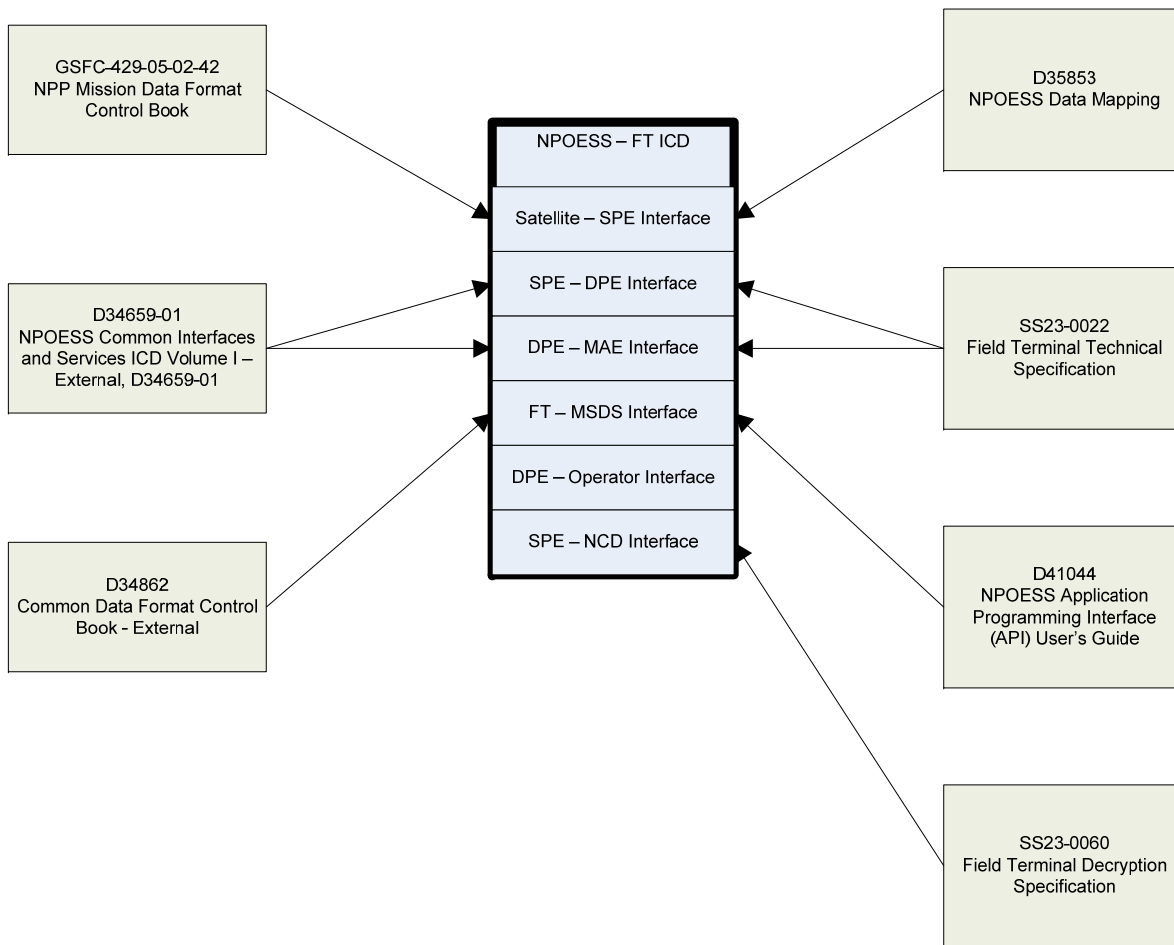


Figure 2.2-1, NPOESS – FT ICD Data Package Diagram

### **2.3 Protocol Versioning**

The NPOESS System Specification, SY15-0007, identifies the versions of protocols used for the NPOESS interfaces that are referenced within this document.

### **2.4 Precedence**

In the event of conflict between a compliance document listed in Table 2.2-1, ICD Compliance and Reference Documents and the contents of this document, the NPOESS SE&I organization in conjunction with the IPO shall resolve the conflict for all Class 1 documents. For all Class 2 documents, the NPOESS SE&I organization shall resolve the conflict. In the event of a conflict between this document and a reference document listed in Table 2.2-1, ICD Compliance and Reference Documents, this document takes precedence.

### 3.0 INTERFACES

The eight FT interfaces described in this ICD are the NPP Satellite—SPE, NPOESS Satellite—SPE (HRD), NPOESS Satellite—SPE (LRD), the SPE—DPE, the DPE—MAE, the FT—MSDS, the FT Operator—DPE, and the SPE-NCD interfaces. Figure 3.0-1, Field Terminal Interfaces Architecture, provides a high-level depiction of the field terminal interfaces.



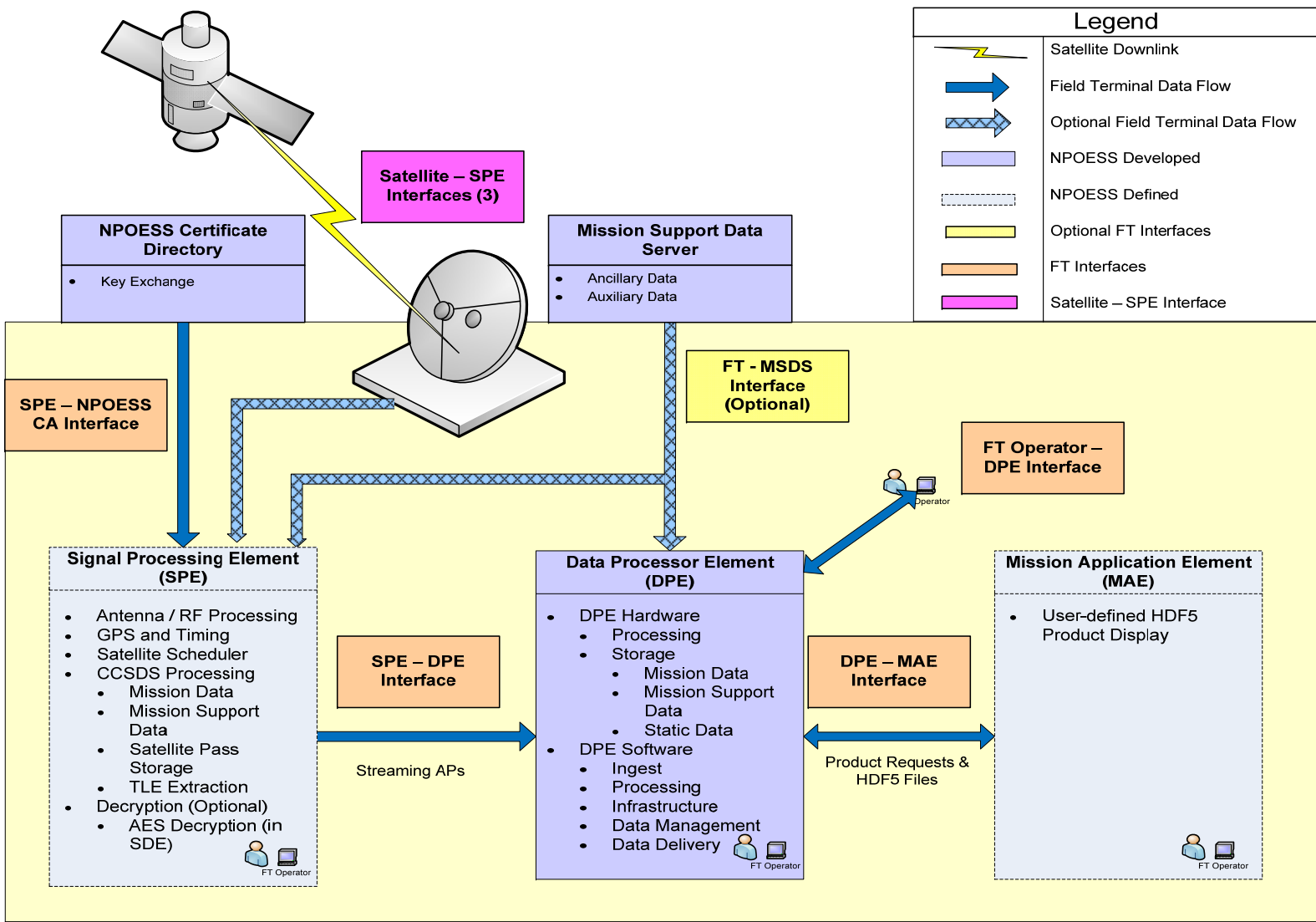


Figure 3.0-1, Field Terminal Interfaces Architecture

Background information regarding the different elements involved in the Field Terminal Architecture is provided below.

### **Signal Processing Element (SPE)**

The SPE includes the antenna and signal processing hardware. It also includes software necessary to control the antenna, receive the raw downlink data, and process the raw downlink data into Consultative Committee for Space Data Systems (CCSDS) application packets. The SPE accepts NPOESS satellite transmissions in the HRD or LRD downlinks. Because of inherent design parameters, the SPE, with slight modifications, will also accept the NPP HRD downlink<sup>1</sup>. As the spacecraft passes overhead, these downlinks supply mission data and Mission Support Data (MSD)<sup>2</sup> to the FT. This data is a data delivery service class equivalent to Grade 2 as defined in CCSDS 701.0-B, Recommendations for Advanced Orbiting Systems – Network and Data Links: Architectural Specification. The SPE receives the HRD or LRD streams, categorized by Spacecraft ID (SCID) and Virtual Channel ID (VCID), and performs the necessary CCSDS processing to prepare and format the individual Virtual Channel Data Units (VCDU). The SPE then removes all communications artifacts including any encryption if so authorized, and formats the VCDUs into Application Packets (APs) for delivery to the DPE for initial processing.

### **Data Processor Element (DPE)**

The DPE ingests the NPP/NPOESS APs received from the SPE and processes them into data products. The DPE software is capable of graceful degradation in the event of missing data until such time when further generation of products is not possible. Once requested by the MAE, the DPE will format the stored data products into Hierarchical Data Format Release 5 (HDF5) files for delivery to the MAE. Refer to the NPOESS Common Data Format Control Book – External (D34862) for more information about the format of the HDF5 files.

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<sup>1</sup> In order to produce NPP Data Products from the NPP HRD downlink, all supporting data (ancillary and auxiliary data) must be retrieved from the MSDS

<sup>2</sup> NPP HRD downlink does not contain MSD

### **Mission Support Data Server (MSDS)**

The MSDS is provided by NPOESS. The MSDS, also known as the External MSDS (E-MSDS), provides a source to external users, including FT users, for the MSD supplied in the NPOESS HRD downlink as well as the full set of data required to meet all performance requirements for HRD data production. The E-MSDS contains the full set of Official Dynamic Ancillary Data (ODAD), of which only a compressed subset intended to support LRD processing is supplied in the NPOESS HRD/LRD downlinks. However, all data necessary to meet performance thresholds for LRD data products are supplied in the downlink. External users, such as FT operators, can access the E-MSDS via the Internet to retrieve MSD. The MSD supplied by the E-MSDS is the same as that used by the Centrals and includes ancillary data, auxiliary data, ephemeris data and community bulletins/alerts (e.g. software update notices).

### **Mission Application Element (MAE)**

The MAE accepts data products (e.g., Raw Data Records (RDRs), Sensor Data Records (SDRs), Temperature Data Records (TDRs), and Environmental Data Records (EDRs), Intermediate Products (IPs), Application Related Products (APRs), metadata, reports, and messages) in HDF5 format from the DPE. Further expansion of the MAE functionality is user-dependent and may include analysis toolkits and other post-production tools, at the discretion of the implementing agency. The DPE is able to support multiple MAEs simultaneously and the DPE-MAE interface is not affected by the number of MAEs that are connected.

### **NPOESS Certificate Directory (NCD)**

The NCD contains the NPOESS PKI certificates needed to process the key transports from the NPOESS satellite. There are two keys which are needed to process the key transports: the NPOESS Digital Signature key and the NPOESS Key Agreement Key. The certificates for these keys are made available on the NCD. In addition to the certificates, the Certificate Revocation List (CRL) is made available on the NCD.

In addition to these interfaces, Field Terminals must also interface with their Sponsoring Agency for registration with the NPOESS Program (this interaction is not detailed in this ICD as it is Field Terminal dependent and must be negotiated with the specific

Sponsoring Agency).

### **Field Terminal Sponsoring Agency Certificate Authority (FTCA)**

The FTCA accepts PKI certificate requests for its FTs, issues PKI certificates, and provides FT characteristics to the IPO. Elliptical Curve Cryptography algorithms are used to generate the FT PKI encryption keys. When the certificates are issued, the FTCA provides the FT characteristics, including the Distinguishing Name (DN), to the NPOESS IPO. The DN is used by NPOESS to generate a Master Distribution list to keep track of which FTs have certificates. [Note: this interface is not depicted in the interface diagram above or documented in this ICD; Field Terminals must consult their respective Sponsoring Agencies for this interaction.]

### 3.1 Interface Description

Table 3.1-1, Field Terminal Interface Map with Entity Mnemonic, provides a matrix depiction of the interfaces with their applicable mnemonics. The interfaces shown in the matrix are read from Sender to Receiver in a horizontal to vertical direction (to locate the sender from a listed interface, move horizontally to the shaded entry; to locate the receiver, move vertically to the shaded entry.)

**Table 3.1-1, Field Terminal Interface Map with Entity Mnemonic**

|                |  |                          |              |                          |                          |             |
|----------------|--|--------------------------|--------------|--------------------------|--------------------------|-------------|
| NPP *<br>(PS)  | X_PS_FS-PH<br>X_PS_FS-LH                             |                          |              |                          |                          |             |
| NPOESS<br>(SS) | X_SS_FS-PH<br>X_SS_FS-PL<br>X_SS_FS-LH<br>X_SS_FS-LL |                          |              |                          |                          |             |
|                | SPE *<br>(FS)  | T_FS_FD-PB<br>T_FS_FD-LB |              |                          |                          |             |
|                |  | DPE<br>(FD)              |              | X_FD_FM-PB<br>X_FD_FM-LB | X_FD_FO-PB<br>X_FD_FO-LB |             |
|                | X_MS_FT-PB<br>X_MS_FT-LB                             | X_MS_FT-PB<br>X_MS_FT-LB | MSDS<br>(MS) |                          |                          |             |
|                |  | X_FM_FD-PB<br>X_FM_FD-LB |              | MAE *<br>(FM)            |                          |             |
|                |  | X_FO_FD-PB<br>X_FO_FD-LB |              |                          | FT Operator<br>* (FO)    |             |
|                | X_NP_FS-PB0100<br>X_NP_FS-LB0100                     |                          |              |                          |                          | NCD<br>(NP) |

| Legend |                           |    |                      |    |                           |
|--------|---------------------------|----|----------------------|----|---------------------------|
| X      | External                  | FD | DPE                  | LB | Logical Interface – Both  |
| T      | Internal                  | FM | MAE                  | LL | Logical Interface – LRD   |
| R      | Intra                     | FS | SPE                  | LH | Logical Interface – HRD   |
|        |                           | MS | MSDS                 | PB | Physical Interface – Both |
|        |                           | PS | NPP Space Segment    | PL | Physical Interface – LRD  |
|        |                           | SS | NPOESS Space Segment | PH | Physical Interface – HRD  |
| *      | Non-NPOESS Program Entity | FT | Field Terminal – FT  | FO | FT Operator               |
|        |                           | NP | NPOESS Program       |    |                           |

### 3.1.1 External Data Flow

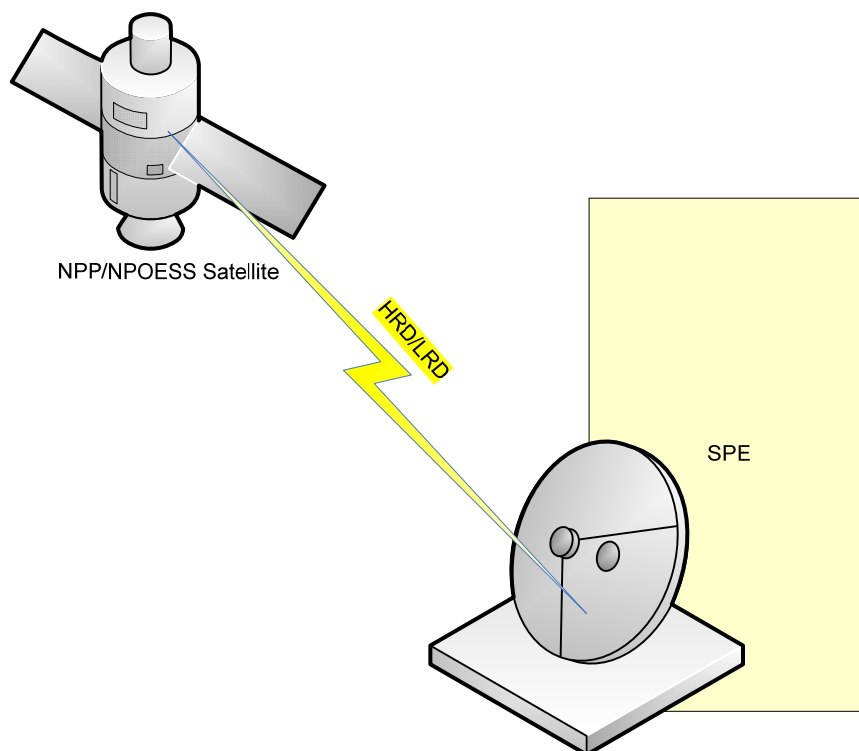
#### 3.1.1.1 NPOESS/NPP Satellite -- SPE Interface External Data Flow

The satellite to SPE interface provides the RF link between the satellite and the Field Terminal. The satellite broadcasts a signal that contains the real-time mission data consisting of sensor earth scene (science) data, Geographically Constrained Dynamic Ancillary Data, Globally Relevant Mission Support Data, Mission Notices, and other data needed to support the NPOESS/NPP Mission<sup>3</sup>. The NPP HRD, NPOESS HRD, and NPOESS LRD broadcasts are at different frequencies and data rates and contain different data content. The NPOESS HRD is broadcast in the X-band with an information rate (fully decoded) of 17.422 Megabits per second (Mbps) while the NPP HRD is broadcast with an information rate (fully decoded) of 13.066 Mbps. The LRD is broadcast in L-band at an information rate (fully decoded) of 3.379 Mbps. Therefore, the antenna and receiver portion of the SPE for the HRD and LRD FT configurations will require different design attributes.

Figure 3.1.1.1-1, NPOESS/NPP Satellite – SPE Interface Architecture, illustrates the interface between the Spacecraft and the FT SPE. Since the Field Terminals will not perform any satellite control functions, the HRD and LRD downlinks are unidirectional from the spacecraft to the Field Terminal. A typical FT will be designed to receive either the LRD or HRD downlink.

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<sup>3</sup> The NPP HRD downlink does not contain Geographically Constrained Dynamic Ancillary Data, Globally Relevant Mission Support Data, Mission Notices, and other data (MSD)



**Figure 3.1.1.1-1, NPOESS/NPP Satellite – SPE Interface Architecture**

Table 3.1.1.1-1, NPP – SPE Interface Data Flow (Informational Only), and Table 3.1.1.1-2, NPOESS – SPE Interface Data Flow, present top-level matrices that supplement Figure 3.1.1.1-1, NPOESS/NPP Satellite – SPE Interface Architecture. These tables provide the interface IDs, titles, descriptions, and frequencies of occurrence. The tables also provide a general description of the data that is transferred across each interface.

**Table 3.1.1.1-1, NPP – SPE Interface Data Flow (Informational Only)**

| Interface ID   | Data ID  | Interface / Data Title                       | Description                 | Frequency                 | Sender        | Receiver |  |
|----------------|--|--|-----------------------------|---------------------------|---------------|----------|--|
| X_PS_FS-PH2000 |  | NPP – HRD to FTS SPE RF Interface (Physical) | NPP to SPE RF HRD downlink  | Asynchronous <sup>1</sup> | NPP Satellite | FTS SPE  |  |
| X_PS_FS-LH2000 |  | NPP – HRD to FTS SPE Interface (Logical)     | NPP to FTS SPE HRD downlink | Asynchronous <sup>1</sup> | NPP Satellite | FTS SPE  |  |
| X_PS_FS-LH2000 | N/A (Refer to the NPP Mission Data Format Control Book, GSFC 429-05-02-42) | NPP – HRD Downlink Data (X-Band)             | NPP HRD to FTS SPE downlink | Asynchronous <sup>1</sup> | NPP Satellite | FTS SPE  |  |

**Table 3.1.1.1-2, NPOESS – SPE Interface Data Flow**

| Interface ID   | Data ID                               | Interface / Data Title                          | Description                       | Frequency                 | Sender           | Receiver |  |
|----------------|---------------------------------------|---|-----------------------------------|---------------------------|------------------|----------|--|
| X_SS_FS-PH2100 |                                       | NPOESS – HRD to FTS SPE RF Interface (Physical) | NPOESS to FTS SPE RF HRD downlink | Asynchronous <sup>1</sup> | NPOESS Satellite | FTS SPE  |  |
| X_SS_FS-PL2100 |                                       | NPOESS – LRD to FTS SPE RF Interface (Physical) | NPOESS to FTS SPE RF LRD downlink | Asynchronous <sup>1</sup> | NPOESS Satellite | FTS SPE  |  |
| X_SS_FS-LH2100 |                                       | NPOESS – HRD to FTS SPE Interface (Logical)     | NPOESS to FTS SPE HRD downlink    | Asynchronous <sup>1</sup> | NPOESS Satellite | FTS SPE  |  |
| X_SS_FS-LL2100 |                                       | NPOESS – LRD to FTS SPE Interface (Logical)     | NPOESS to FTS SPE LRD downlink    | Asynchronous <sup>1</sup> | NPOESS Satellite | FTS SPE  |  |
| X_SS_FS-LH2100 | Refer to Appendix E of this document. | NPOESS – HRD Downlink Data (X-Band)             | NPOESS Data                       | Asynchronous <sup>1</sup> | NPOESS Satellite | FTS SPE  |  |

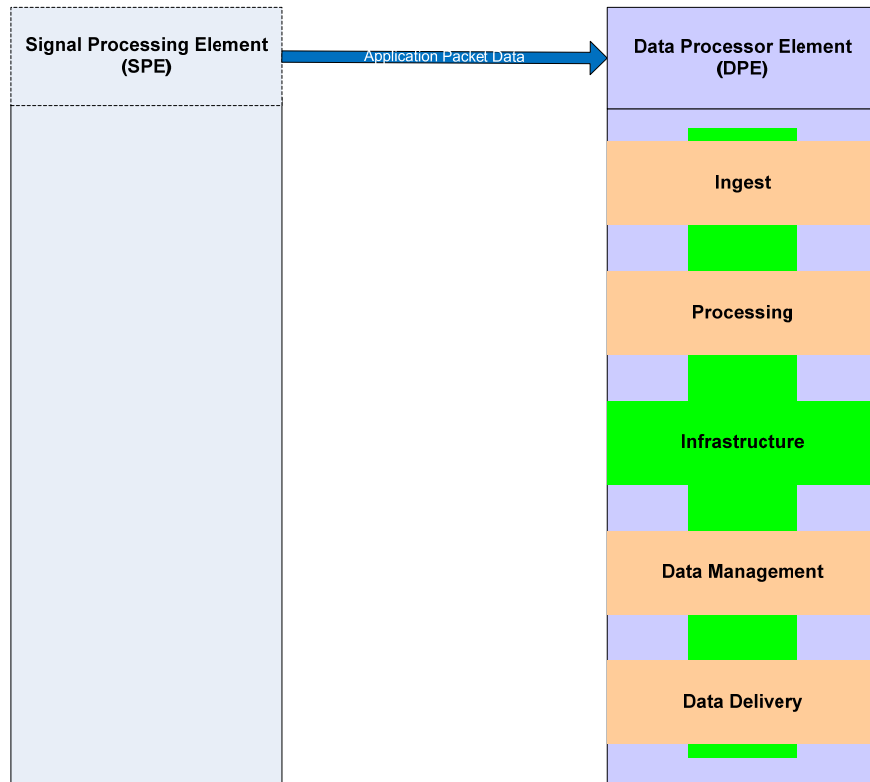


| Interface ID   | Data ID                               | Interface / Data Title              | Description | Frequency                 | Sender           | Receiver |  |
|----------------|---------------------------------------|-------------------------------------|-------------|---------------------------|------------------|----------|--|
| X_SS_FS-LL2100 | Refer to Appendix E of this document. | NPOESS – LRD Downlink Data (L-Band) | NPOESS Data | Asynchronous <sup>1</sup> | NPOESS Satellite | FTS SPE  |  |

<sup>1</sup>High Rate Data (for NPP and NPOESS satellites) and Low Rate Data (for NPOESS satellite only) are continually broadcast. However, this interface is only active when receiving – when the Field Terminal has acquired the HRD or LRD broadcast signal.

### 3.1.1.2 SPE – DPE Interface External Data Flow

The SPE to DPE interface is the connection for transferring NPP HRD, NPOESS HRD, or NPOESS LRD between the SPE and the DPE. The SPE to DPE interface supports the transfer of various mission data and MSD in the form of APs<sup>4</sup>. In the event of a short-term loss of the interface, a field terminal operator can manually initiate a replay of APs from the SPE.



**Figure 3.1.1.2-1, Field Terminal SPE – DPE Interface Architecture**

Figure 3.1.1.2-1, Field Terminal SPE – DPE Interface Architecture, presents the interface data flows between the SPE and DPE. It also reflects the DPE subsystem that is receiving or requesting the data.

Table 3.1.1.2-1, SPE-DPE Interface Data Flow presents a top-level matrix that supplements. The table provides the interface IDs, titles, descriptions, frequencies of occurrence. The table also provides a general description of the data that is transferred

<sup>4</sup> NPP HRD downlink does not contain MSD, this data must be retrieved from the MSDS by the FT

across each interface.

**Table 3.1.1.2-1, SPE-DPE Interface Data Flow**

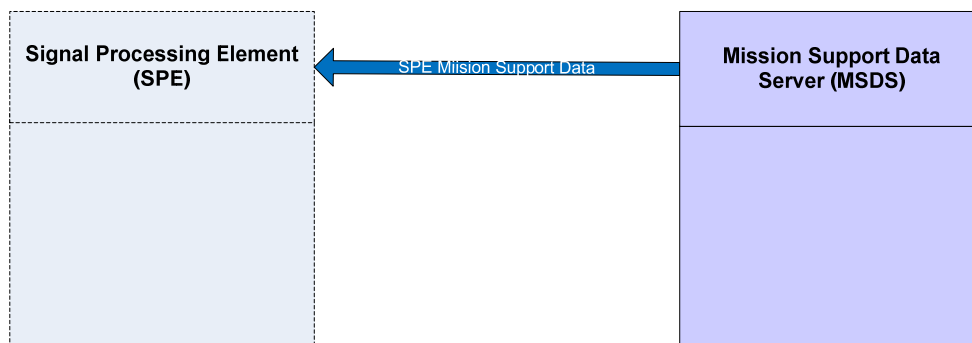
| Interface ID   | Data ID                               | Interface / Data Title         | Description         | Frequency    | Sender | Receiver |  |
|----------------|---------------------------------------|--------------------------------|---------------------|--------------|--------|----------|--|
| T_FS_FD-PB3000 |                                       | SPE – DPE Interface (Physical) | Unidirectional      | Asynchronous | SPE    | DPE      |  |
| T_FS_FD-LB3000 |                                       | SPE – DPE Interface (Logical)  | Unidirectional      | Asynchronous | SPE    | DPE      |  |
| T_FS_FD-LB3000 | Refer to Appendix E of this document. | NPOESS Application Packets     | Application Packets | Asynchronous | SPE    | DPE      |  |

### 3.1.1.3 FT – MSDS Interface External Data Flow

The FT to MSDS interface involves both the SPE and DPE elements of the FT. However, they are treated as one interface in this ICD since the network connections, data format and data structures are identical for the interface to either element. The following two subsections provide details of the MSD flow and usage to the SPE and DPE, respectively.

#### 3.1.1.3.1 SPE – MSDS Interface External Data Flow

The SPE to MSDS interface provides the connectivity for the transfer of Two-Line Element (TLE) sets to the SPE via the Internet. The MSDS is used as a secondary source for TLE data required by the SPE satellite scheduling function. Figure 3.1.1.3.1-1, Field Terminal SPE – MSDS Interface Architecture, shows the interface data flow and logical interfaces between the SPE and MSDS.



**Figure 3.1.1.3.1-1, Field Terminal SPE – MSDS Interface Architecture**

Table 3.1.1.3.1-1, FT – MSDS Interface Data Flow, supplements Figure 3.1.1.3.1-1, Field Terminal SPE – MSDS Interface Architecture, by providing a top-level matrix identifying the logical interfaces and data flows between SPE and MSDS. The table provides interface IDs, titles, descriptions, frequencies of occurrence, and data flows between the elements.

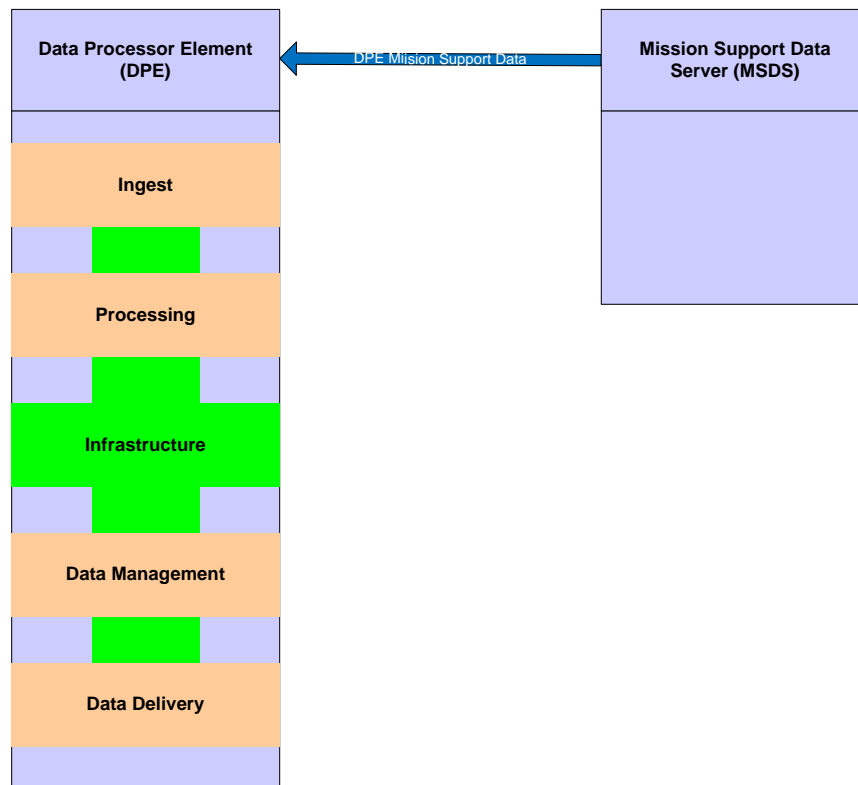
**Table 3.1.1.3.1-1, FT – MSDS Interface Data Flow**

| Interface ID   | Data ID  | Interface / Data Title   | Description    | Frequency   | Sender | Receiver |  |
|----------------|--|--|----------------|-------------|--------|----------|--|
| X_MS_FT-PB4000 |  | FT – MSD External Interface (Physical)   | Unidirectional | As Required | MSDS   | SPE/DPE  |  |
| X_MS_FT-LB4000 |  | FT – MSD External Interface (Logical)  | Unidirectional | As Required | MSDS   | SPE/DPE  |  |
| X_MS_FT-LB4000 | See interface X_NP_NU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01 | See interface X_NP_NU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01 | Data           | As Required | MSDS   | SPE/DPE  |  |

### 3.1.1.3.2 DPE – MSDS Interface External Data Flow

The DPE to MSDS interface provides the connectivity for a secondary source of ancillary data, TLE sets, and other support data to the DPE via an external communications network. This interface may not be possible at all field terminal locations.

Figure 3.1.1.3.2-1, Field Terminal DPE – MSDS Interface Architecture, shows the interface data flow and logical interfaces between the DPE and MSDS.

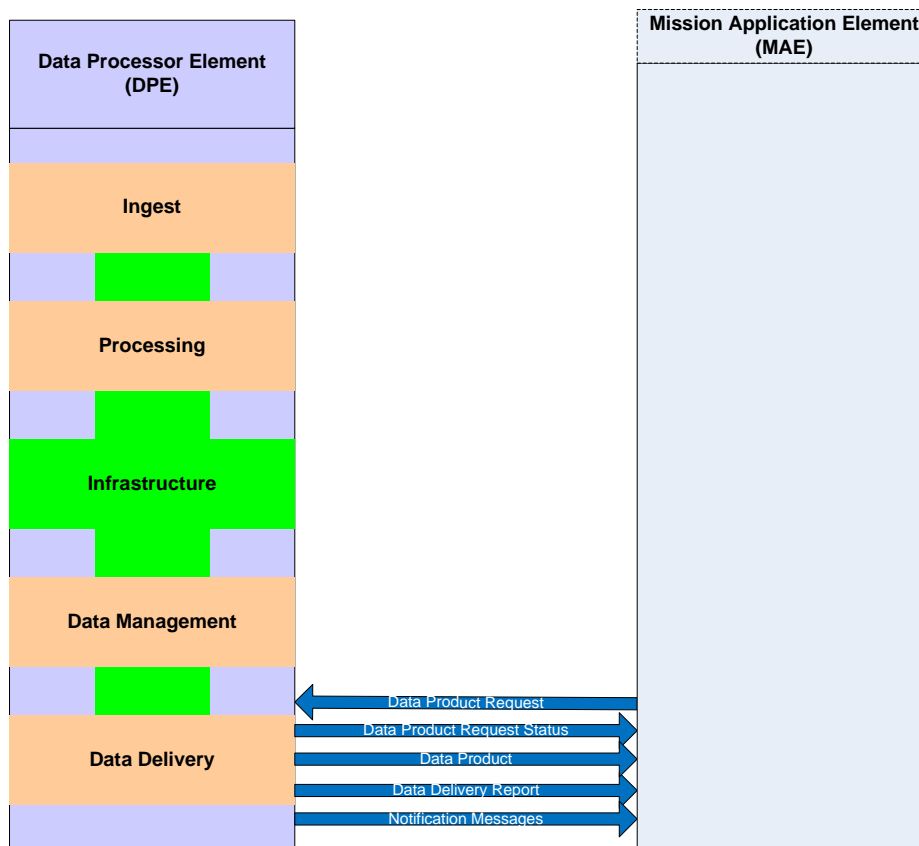


**Figure 3.1.1.3.2-1, Field Terminal DPE – MSDS Interface Architecture**

Table 3.1.1.3.1-1, FT – MSDS Interface Data Flow, supplements Figure 3.1.1.3.2-1, Field Terminal DPE – MSDS Interface Data Flow, by providing a top-level matrix identifying the logical interfaces and data flows between DPE and MSDS. It also provides interface IDs, titles, descriptions, frequencies of occurrence, and data flows between the elements.

### 3.1.1.4 DPE – MAE Interface External Data Flow

The DPE to MAE interface provides the data connection for transferring HDF5-formatted products, reports, and status messages produced by the DPE to the MAE. The formatted products enable the user to display and analyze the data processed by the field terminal. Figure 3.1.1.4-1, Field Terminal DPE – MAE Interface Architecture, shows the data flow between the DPE and MAE.



**Figure 3.1.1.4-1, Field Terminal DPE – MAE Interface Architecture**

Table 3.1.1.4-1, Field Terminal DPE – MAE Interface Data Flow, supplements Figure 3.1.1.4-1, Field Terminal DPE – MAE Interface Architecture, by providing a top-level matrix that identifies the logical interfaces and data flows between the DPE and MAE. The table provides the interface IDs, titles, descriptions, frequencies of occurrence, and data flows between the two elements.



**Table 3.1.1.4-1, DPE-MAE Interface Data Flow**

| Interface ID   | Data ID   | Interface / Data Title                                      | Description   | Frequency   | Sender | Receiver |  |
|----------------|---|---|---------------|-------------|--------|----------|--|
| X_FM_FD-PB5000 |   | DPE – MAE Network Connection (Physical)                     | Bidirectional | As Required | DPE    | MAE      |  |
| X_FM_FD-LB5000 | N/A   | DPE – MAE Deliverable Data Product Request (Logical)        | Data          | As Required | MAE    | DPE      |  |
| X_FD_FM-LB5100 | N/A (Refer to the NPOESS Common Interfaces and Services ICD, Volume I – External, D34659-01, Section 3.5.2.3) for details | DPE – MAE Deliverable Data Product Request Status (Logical) | Data          | As Required | DPE    | MAE      |  |
| X_FD_FM-LB5200 | Refer to Section Appendix F of this document.   | DPE – MAE Deliverable Data Products (Logical)               | Data          | As Required | DPE    | MAE      |  |
| X_FD_FM-LB5300 | DP_NU-L00050-000  | DPE – MAE Data Delivery Report (Logical)                    | Data          | As Required | DPE    | MAE      |  |
| X_FD_FM-LB5400 | DP_NU-L00060-000  | DPE – MAE Deliverable Data Automated Notification (Logical) | Data          | As Required | DPE    | MAE      |  |

### **3.1.1.5 FT Operator – DPE Interface External Data Flow**

The Field Terminal Operator (FTO) interacts with the DPE using several Graphical User Interfaces (GUI) via a graphical display and standard input devices selected by the procuring agency. The GUIs may interact with the DPE through a variety of different protocols that allow remote display of applications as defined by the procuring agency.

### 3.1.1.6 Interface Integration Flow

The traceability of the physical interfaces to their associated logical interfaces is shown in Appendix B, Table B-1, Interface and Data Mnemonic Mapping Matrix. This table includes instances where one logical interface is associated with multiple physical interfaces and vice versa.

### **3.1.1.7 SPE – NPOESS Certificate Directory Interface Data Flow**

The Field Terminal SPE to NCD interface supports the public key exchange enabling approved field terminals to decrypt downlinked NPOESS data. Field Terminals coordinate with their Field Terminal Sponsoring Agency, who coordinates with the NPOESS Program Office, to allow and facilitate access to NPOESS encrypted data. See the Field Terminal Decryption Specification, SS23-0060, for details on SPE decryption of NPOESS downlink data.

Note: A remote Field Terminal can connect to the NCD either using the SPE to NCD interface directly (in depot before deployment, for instance, where network connectivity is available), or indirectly by inserting the keys manually by the FT Operator user interface to the SPE.

## 3.2 Interface Conventions

### 3.2.1 Interface Mnemonic Definition

Interfaces are named and numbered in accordance with the NPOESS Interface Mnemonic Definition. The structure of an Interface Mnemonic is defined in NPOESS Common Data Format Control Book – External (CDFCB-X) Volume I – Overview in Section 3.1, Interface Mnemonic Definition. Figure 3.2.1-1, NPOESS Interface and Service Mnemonic Definition, describes the structure for interface mnemonic naming convention. All physical and logical interfaces are defined and constructed in accordance with Table 3.2.1-1, NPOESS Interface and Service Mnemonic Description.

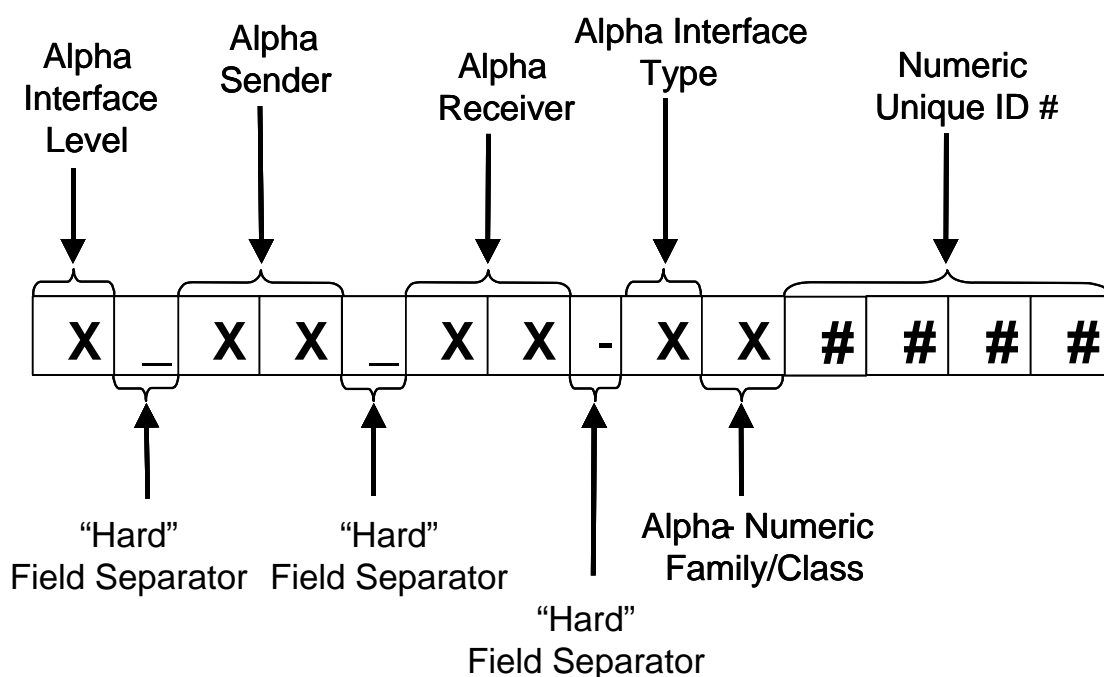


Figure 3.2.1-1, NPOESS Interface and Service Mnemonic Definition

**Table 3.2.1-1, NPOESS Interface and Service Mnemonic Description**

| Field Position | Value         | Range  | Comments  |
|----------------|---------------|--|---|
| 1              | Alpha         | R = Intra-Segment<br>T = Inter-Segment<br>X = External         | Defines the level of the interface. Should an interface be both internal and external, the external indicator takes precedence.   |
| 2              | _             | "_" (Underscore)   | Separator between interface level and Sender  |
| 3-4            | Alpha         | Table 3.2.1-2, Interface Sender and Receiver Designator        | Two letter symbol denoting the Sender in the interface. See Table 3.2.1-2, Interface Sender and Receiver Designator for a complete list of two-letter designators.  |
| 5              | _             | "_" (Underscore)   | Separator between Sender and Receiver   |
| 6-7            | Alpha         | Table 3.2.1-2, Interface Sender and Receiver Designator        | Two letter symbol denoting the Receiver in the interface. See Table 3.2.1-2, Interface Sender and Receiver Designator for a complete list of two-letter designators.  |
| 8              | -             | "-" (Hyphen)   | This is a hard field separator.   |
| 9              | Alpha         | P = Physical Interface<br>L = Logical Interface<br>S = Service | Defines the type of interface or service.   |
| 10             | Alpha-Numeric | A – Z, 0 – 9   | Optionally used to add further definition to the mnemonic. See Table 3.2.1-3, Family/Class Identifiers for list of optional mnemonic identifiers.<br>If this convention is not used, the sequential numbering described directly below (definition for fields 11-14) is used for this field.                            |
| 11-14          | Numeric       | 0 – 9999   | Sequential number of the interface starting at zero (to include family/class interfaces) and increment sufficiently (e.g., 10) to allow additional interfaces to be inserted as appropriate.<br>These field positions can be augmented by field position 10, if it is not being used for detailed mnemonic definitions. |

Table 3.2.1-2, Interface Sender and Receiver Designator provides the two-letter designator for the sender/receiver of the respective interfaces. The sender/receiver can be a location/site, segment, or hardware/equipment classification.

**Table 3.2.1-2, Interface Sender and Receiver Designator**

| S/R Identifier | Identifier Description  |
|----------------|---|
| AD             | Comprehensive Large Array-data Stewardship System (CLASS)                     |
| AF             | Air Force Weather Agency (AFWA)   |
| AN             | Ancillary Data  |
| AM             | Alternate Mission Management Center (AMMC)                                    |
| AT             | Advanced Technology Microwave Sounder (ATMS)                                  |
| AU             | Ground Integrated Support Facility  |
| BA             | Ball Aerospace Technology Corporation (BATC)                                  |
| C3             | Command, Control and Communications Segment (C3S)                             |
| CN             | Centrals  |
| CR             | Cross-track Infrared Sounder (CrIS)   |
| CV             | NPOESS Science Investigator Processing System (NSIPS)                         |
| DC             | Advanced Data Collection System (A-DCS)                                       |
| DP             | Interface Data Processing Segment (IDPS)                                      |
| FC             | Suitland Federal Complex  |
| FD             | Field Terminals Data Processor Element  |
| FM             | Field Terminals Mission Application Element                                   |
| FN             | Fleet Numerical Meteorology and Oceanography Center (FNMOC)                   |
| FO             | Field Terminal Operator   |
| FS             | Field Terminals Signal Processing Element                                     |
| FT             | Field Terminal Segment (FTS)  |
| IN             | Indianapolis Support Node   |
| LA             | Long Term Monitoring (LTM) Support Node                                       |
| LS             | NPOESS Launch Support Segment (LSS)   |
| MM             | Mission Management Center (MMC)   |
| MS             | Mission Support Data  |
| NE             | NOAA/National Environmental Satellite, Data, and Information Service (NESDIS) |
| NP             | National Polar-orbiting Operational Environmental Satellite System (NPOESS)   |
| NU             | NPOESS Authorized User  |
| NV             | Naval Oceanographic Office (NAVO)   |
| OM             | Ozone Mapping and Profiler Suite (OMPS)                                       |
| PI             | NPOESS Preparatory Project (NPP) Instruments                                  |
| PS             | NPOESS Preparatory Project (NPP) Space Segment                                |
| RS             | Receptor Site   |

| S/R Identifier | Identifier Description                              |
|----------------|---|
| SA             | Search and Rescue Satellite Aided Tracking (SARSAT) |
| SD             | Science Data Segment (SDS)                          |
| SP             | Space Integrated Support Facility                   |
| SS             | NPOESS Space Segment                                |
| SV             | Svalbard  |
| VI             | Visible/infrared Imager/Radiometer Suite (VIIRS)    |
| WS             | White Sands   |

Table 3.2.1-3, Family/Class Identifiers provides a listing of the single letter designators used to define a family or class associated with the interface as it pertains to a specific site/location or type of equipment/hardware.



**Table 3.2.1-3, Family/Class Identifiers**

| Identifier | Identifier Description           |
|------------|----------------------------------|
| A          | AFWA                             |
| B          | Both LRD and HRD Field Terminals |
| C          | DoD Common                       |
| H          | HRD Field Terminal               |
| L          | LRD Field Terminal               |
| M          | MSDS                             |
| N          | NOAA                             |
| S          | Flight Vehicle Simulator         |
| W          | Web Server                       |

### 3.2.2 Data Mnemonic Definition

Data flowing across a logical interface is distinguished in most cases as individual data items by assigning unique data mnemonics. By assigning a unique data mnemonic to each data item, this allows the aggregate data to be “mapped” to the logical interface(s). The two formats for the construction of data mnemonics are defined in NPOESS Common Data Format Control Book – External Volume I - Overview, D34862-01, Section 3.2.1, Data Mnemonic Definition for Data Formats and Section 3.2.2, Data Mnemonic Definition for NPOESS Data Products.

### 3.3 Field Terminal Interface Definitions

#### 3.3.1 NPP Satellite – HRD SPE Interface

##### 3.3.1.1 NPP – HRD SPE RF Interface (Physical) (Informational Only)

|                         |  |
|-------------------------|--|
| <b>Interface Name</b>   | NPP – HRD SPE RF Interface (Physical)  |
| <b>Interface Number</b> | X_PS_FS-PH2000   |
| <b>Description</b>      | <p>This interface is an X-Band RF broadcast used to downlink HRD from the NPP spacecraft to any in-view FT SPE.</p> <p>Any field terminal agency who must verify orbit-averaged availability may use as a benchmark for analysis the worst case rain fade location (latitude of 4.5 deg, N and a longitude of 169.5 deg, E), using a reference ground terminal G/T of 22.7 dBi/K, an ideal ground terminal receiver, antenna diameter of 3 m, and ground terminal axial ratio of 2 dB. These parameters are provided for the performance of the broadcast link in lieu of any ideal receiver implementation.</p> |

##### 3.3.1.1.1 OPSCON Scenario

|               |                                    |
|---------------|------------------------------------|
| <b>System</b> | SYS-040-010, FT HRD/LRD Operations |
|---------------|------------------------------------|

##### 3.3.1.1.2 Data Transaction and Response

|                 |                                       |
|-----------------|---------------------------------------|
| <b>Sender</b>   | NPP Spacecraft                        |
| <b>Receiver</b> | NPP HRD-configured Field Terminal SPE |
| <b>Response</b> | None                                  |

##### 3.3.1.1.3 Data Content, Data Format, and Data Mnemonic

|                                     |   |
|-------------------------------------|---|
| <b>Data Content and Data Format</b> | <p>The interface data content includes transfers from both instrument and spacecraft sources, each of which is identified in separate documentation. The instrument data content includes the High Rate Data as identified by virtual channel ID and application packet ID in the NPP MDFCB, GSFC 429-05-02-42. The spacecraft data content includes the High Rate Data as identified by virtual channel ID only in the NPP X-Band Format ICD, GSFC 429-04-02-28 Table 5-1.</p> <p>The data format includes multiple levels of encoding. These are defined down to the source application packet, also called CCSDS Path Protocol Data Unit (CP PDU) in the NPP X-Band Format ICD, GSFC 429-04-02-28. The application packet level formatting is in accordance with the NPP MDFCB, GSFC 429-05-02-42.</p> |
|-------------------------------------|---|

**Data Mnemonic**      N/A

### 3.3.1.1.4 Protocol and Parameters

**Protocol**              The NPP RF signal and data encoding protocols are defined in the NPP Spacecraft HRD RF ICD to the Direct Broadcast Stations, GSFC 429-03-02-24 and in the NPP X-Band Format ICD GSFC 429-04-02-28.

**Parameters**          Refer to the Field Terminal Technical Specification (SS23-0022), the NPP MDFCB, GSFC-429-05-02-42), the NPP Spacecraft HRD RFICD to the Direct–Broadcast Stations (GSFC 429-04-02-24), and the NPP X-Band Data Format ICD (GSFC 429-04-02-28) for more information and a description of the link characteristics.

### 3.3.1.1.5 Data Volume and Data Rate

**Data Volume**          N/A

**Data Rate**              The Channel Data Rate from the Spacecraft to Direct Broadcast Users of HRD occurs at 30 Mbps. This 30 Mbps rate includes overhead from Reed Solomon Encoding and randomization, convolutional encoding and prepending the Attached Sync Marker.

The fully decoded data rate is 13.066 Mbps which is derived from the following formula:

$$\begin{aligned} \text{Fully Decoded Data Rate} &= \text{Channel Data Rate} * \text{R-S Code Rate} \\ &* \text{Convolution Code Rate} * \text{CCSDS overhead exclusive of ASM} \\ &= 30 \text{ Mbps} * (1/2) * (223/255) * (1020/2024) = 13.066 \text{ Mbps} \end{aligned}$$

### 3.3.1.1.6 Interface Characteristics

**Frequency**              The X-Band RF HRD is broadcast continuously at a carrier frequency of 7812 MHz. Refer to Appendix C of the NPOESS System Specification (SY15-0007) for additional characteristics of the RF link.

**Timeouts**              None

**Thresholds**              None

### 3.3.1.1.7 Security

|                                       |      |
|---------------------------------------|------|
| <b>Client Authentication Required</b> | N/A  |
| <b>Encryption Required</b>            | None |

### 3.3.1.1.8 Priority and Constraints

|                    |   |
|--------------------|---|
| <b>Priority</b>    | Time ordered, real-time data transmissions          |
| <b>Constraints</b> | No retransmissions are available from the satellite |

### 3.3.1.1.9 Effectivity

|                              |                          |
|------------------------------|--------------------------|
| <b>Interface Effectivity</b> | State 2 – NPP and NPOESS |
|------------------------------|--------------------------|

### 3.3.1.2 NPP – HRD SPE Interface (Logical) (Informational Only)

|                         |  |
|-------------------------|--|
| <b>Interface Name</b>   | NPP – HRD SPE Interface (Logical)  |
| <b>Interface Number</b> | X_PS_FS-LH2000   |
| <b>Description</b>      | This interface is an X-Band RF broadcast used to downlink HRD from the NPP spacecraft to any in-view FT SPE. |

#### 3.3.1.2.1 OPSCON Scenario

|               |                                    |
|---------------|------------------------------------|
| <b>System</b> | SYS-040-010, FT HRD/LRD Operations |
|---------------|------------------------------------|

#### 3.3.1.2.2 Data Transaction and Response

|                 |                                       |
|-----------------|---------------------------------------|
| <b>Sender</b>   | NPP Spacecraft                        |
| <b>Receiver</b> | NPP HRD-configured Field Terminal SPE |
| <b>Response</b> | Unidirectional flow.                  |

#### 3.3.1.2.3 Data Content, Data Format, and Data Mnemonic

|                                     |   |
|-------------------------------------|---|
| <b>Data Content and Data Format</b> | <p>The interface data content includes transfers from both instrument and spacecraft sources, each of which is identified in separate documentation. The instrument data content includes the High Rate Data as identified by virtual channel ID and application packet ID in the NPP MDFCB, GSFC 429-05-02-42. The spacecraft data content includes the High Rate Data as identified by virtual channel ID only in the NPP X-Band Format ICD, GSFC 429-04 -02-28 Table 5-1.</p> <p>The data format includes multiple levels of encoding. These are defined down to the source application packet, also called CCSDS Path Protocol Data Unit (CP PDU) in the NPP X-Band Format ICD, GSFC 429-04-02-28. The application packet level formatting is in accordance with the NPP MDFCB GSFC 429-05-02-42.</p> |
| <b>Data Mnemonic</b>                | N/A (NPP documentation does not make use of data mnemonics.)  |

#### 3.3.1.2.4 Protocol and Parameters

|                   |   |
|-------------------|---|
| <b>Protocol</b>   | The NPP RF signal and data encoding protocols are defined in the NPP Spacecraft HRD RF ICD to the Direct Broadcast Stations, GSFC 429-03-02-24 and in the NPP X-Band Format ICD, GSFC 429-04-02-28. |
| <b>Parameters</b> | See Section 3.3.1.1.4 for information on these characteristics.   |

### 3.3.1.2.5 Data Volume and Data Rate

**Data Volume** The maximum contact window is 13.1 minutes (786 seconds), which implies a maximum of 1.28 GB of data per orbit. The minimum contact window is defined to be 2.0 minutes (120 seconds), which implies 196 MB effective data volume. This assumes no fill data is downlinked.

**Data Rate** The Channel Data Rate from the Spacecraft to Direct Broadcast Users of HRD occurs at 30 Mbps. This 30 Mbps rate includes overhead from Reed Solomon Encoding and randomization, convolutional encoding and prepending the Attached Sync Marker.

The fully decoded data rate is 13.066 Mbps which is derived from the following formula:

$$\begin{aligned} \text{Fully Decoded Data Rate} &= \text{Channel Data Rate} * \text{R-S Code Rate} \\ &* \text{Convolution Code Rate} * \text{CCSDS overhead exclusive of ASM} \\ &= 30 \text{ Mbps} * (1/2) * (223/255) * (1020/2024) = 13.066 \text{ Mbps} \end{aligned}$$

### 3.3.1.2.6 Interface Characteristics

**Frequency** The X-Band RF HRD is broadcast continuously at a carrier frequency of 7812 MHz. Refer to Appendix C of the NPOESS System Specification (SY15-0007) for additional characteristics of the RF link.

**Timeouts** None

**Thresholds** N/A

### 3.3.1.2.7 Security

**Client Authentication Required** N/A

**Encryption Required** None

### 3.3.1.2.8 Priority and Constraints

**Priority** Time ordered, real-time data transmissions

**Constraints** No MSD is contained in the downlink

### 3.3.1.2.9 Effectivity

**Interface  
Effectivity**

State 2 – NPP and NPOESS

### 3.3.2 NPOESS Satellite – HRD SPE Interface

#### 3.3.2.1 NPOESS – HRD SPE RF Interface (Physical)

|                         |   |
|-------------------------|---|
| <b>Interface Name</b>   | NPOESS – HRD SPE RF Interface (Physical)  |
| <b>Interface Number</b> | X_SS_FS-PH2100  |
| <b>Description</b>      | <p>This interface is an X-Band RF broadcast used to downlink HRD from an NPOESS satellite to any in-view FT SPE.</p> <p>Any field terminal agency who must verify orbit-averaged availability may use as a benchmark for analysis the worst case rain fade location (latitude of 4.5 deg, N and a longitude of 169.5 deg, E), using a reference ground terminal G/T of 17.2 dBi/K, an ideal ground terminal receiver, antenna diameter of 2 m, and ground terminal axial ratio of 2 dB. These parameters are provided for the performance of the broadcast link in lieu of any ideal receiver implementation.</p> |

##### 3.3.2.1.1 OPSCON Scenario

|               |                                    |
|---------------|------------------------------------|
| <b>System</b> | SYS-040-010, FT HRD/LRD Operations |
|---------------|------------------------------------|

##### 3.3.2.1.2 Data Transaction and Response

|                 |  |
|-----------------|--|
| <b>Sender</b>   | NPOESS Spacecraft                        |
| <b>Receiver</b> | NPOESS HRD-configured Field Terminal SPE |
| <b>Response</b> | None                                     |

##### 3.3.2.1.3 Data Content, Data Format, and Data Mnemonic

|                                     |  |
|-------------------------------------|--|
| <b>Data Content and Data Format</b> | <p>The data content is defined by virtual channel ID and application packet ID in the NPOESS Data Mapping, D35853.</p> <p>The data format includes multiple levels of encoding. The RF and pre-CCSDS protocols are specified in the Field Terminal Technical Specification, SS23-0022. The CCSDS protocol layers and application packet formatting is specified in the CDFCB-X, Volume VII, D34862-07.</p> |
| <b>Data Mnemonic</b>                | N/A  |

##### 3.3.2.1.4 Data Transfer, Protocol, and Parameters

|                 |   |
|-----------------|---|
| <b>Protocol</b> | Refer to the Field Terminal Technical Specification (SS23-0022) for the HRD-applicable downlink protocol specification. |
|-----------------|---|



**Parameters** Refer to the Field Terminal Technical Specification (SS23-0022) for the HRD-applicable downlink parameter specifications.

### 3.3.2.1.5 Data Volume and Data Rate

**Data Volume** N/A

**Data Rate** NPOESS HRD is available at a channel data rate of 40 Mbps

### 3.3.2.1.6 Interface Characteristics

**Frequency** The X-Band RF HRD is broadcast continuously at a carrier frequency of 7834 MHz. Refer to Appendix C of the NPOESS System Specification (SY15-0007) for additional characteristics of the RF link.

**Timeouts** No timeouts are considered. Antenna should track from the horizon at the predicted point of acquisition to the horizon at the predicted point of loss of signal.

**Thresholds** None

### 3.3.2.1.7 Security

**Client Authentication Required** N/A

**Encryption Required** N/A

### 3.3.2.1.8 Priority and Constraints

**Priority** None

**Constraints** No retransmissions are available from the satellite

### 3.3.2.1.9 Effectivity

**Interface Effectivity** State 2 – NPP and NPOESS

State 3 – NPOESS Only

### 3.3.2.2 NPOESS – HRD SPE Interface (Logical)

|                         |   |
|-------------------------|---|
| <b>Interface Name</b>   | NPOESS – HRD SPE Interface (Logical)  |
| <b>Interface Number</b> | X_SS_FS-LH2100  |
| <b>Description</b>      | This interface is an X-Band RF broadcast used to downlink HRD from the NPOESS spacecraft to any in-view FT SPE. |

#### 3.3.2.2.1 OPSCON Scenario

|               |                                    |
|---------------|------------------------------------|
| <b>System</b> | SYS-040-010, FT HRD/LRD Operations |
|---------------|------------------------------------|

#### 3.3.2.2.2 Data Transaction and Response

|                 |                              |
|-----------------|------------------------------|
| <b>Sender</b>   | NPOESS Spacecraft            |
| <b>Receiver</b> | NPOESS HRD-configured FT SPE |
| <b>Response</b> | None                         |

#### 3.3.2.2.3 Data Content, Data Format, and Data Mnemonic

|                                     |  |
|-------------------------------------|--|
| <b>Data Content and Data Format</b> | The data content is defined by virtual channel ID and application packet ID in the NPOESS Data Mapping, D35853.<br>The data format includes multiple levels of encoding. The RF and pre-CCSDS protocols are specified in the Field Terminal Technical Specification, SS23-0022. The CCSDS protocol layers and application packet formatting is specified in the CDFCB-X, Volume VII, D34862-07 |
| <b>Data Mnemonic</b>                | Refer to Appendix E of this document for a listing of the data mnemonics associated with this interface.   |

#### 3.3.2.2.4 Protocol and Parameters

|                   |   |
|-------------------|---|
| <b>Protocol</b>   | Refer to the Field Terminal Technical Specification (SS23-0022) for the HRD-applicable downlink protocol specifications.  |
| <b>Parameters</b> | Refer to the Field Terminal Technical Specification (SS23-0022) for the HRD-applicable downlink parameter specifications. |

#### 3.3.2.2.5 Data Volume and Data Rate

|                    |   |
|--------------------|---|
| <b>Data Volume</b> | The maximum contact window is 13.1 minutes (786 seconds) resulting in a 1.71 GB maximum data volume. The minimum contact window during which data processing occurs is 2.0 minutes (120 seconds) resulting in a 261.33 MB effective data volume. This assumes no fill data is downlinked. |
|--------------------|---|

**Data Rate** The Channel Data Rate from the Spacecraft to Direct Broadcast Users of HRD occurs at 40 Mbps. This 40 Mbps rate includes overhead from Reed Solomon Encoding and randomization, convolutional encoding and prepending the Attached Sync Marker.

The fully decoded data rate is 17.422 Mbps which is derived from the following formula:

$$\begin{aligned} \text{Fully Decoded Data Rate} &= \text{Channel Data Rate} * \text{R-S Code Rate} \\ &* \text{Convolution Code Rate} * \text{CCSDS overhead exclusive of ASM} \\ &= 40 \text{ Mbps} * (1/2) * (223/255) * (1020/2024) = 17.422 \text{ Mbps} \end{aligned}$$

### 3.3.2.2.6 Interface Characteristics

**Frequency** The X-Band RF HRD is broadcast continuously at a carrier frequency of 7834 MHz. Refer to Appendix C of the NPOESS System Specification (SY15-0007) for additional characteristics of the RF link.

**Timeouts** None

**Thresholds** N/A

### 3.3.2.2.7 Security

**Client Authentication Required** Client Authentication is required only during Selective Data Encryption (SDE) Mode. Refer to the Field Terminal Decryption Specification (SS23-0060) for more information regarding this mode of operation.

**Encryption Required** The NPOESS spacecraft has the ability to selectively encrypt the HRD mission data, except for the Advanced Data Collection System (A-DCS) broadcast. Refer to the Field Terminal Decryption Specification (SS23-0060) for more information regarding encryption.

### 3.3.2.2.8 Priority and Constraints

**Priority** None

**Constraints** No retransmissions are available from the satellite

### 3.3.2.2.9 Effectivity

**Interface Effectivity** State 2 – NPP and NPOESS  
State 3 – NPOESS Only

### 3.3.3 NPOESS Satellite – LRD SPE Interface

#### 3.3.3.1 NPOESS – LRD SPE RF Interface (Physical)

|                         |   |
|-------------------------|---|
| <b>Interface Name</b>   | NPOESS – LRD SPE RF Interface (Physical)  |
| <b>Interface Number</b> | X_SS_FS-PL2100  |
| <b>Description</b>      | This interface is an L-Band RF broadcast used to downlink LRD from an NPOESS satellite to any in-view FT SPE. |

Any field terminal agency who must verify orbit-averaged availability may use as a benchmark for analysis the worst case rain fade location (latitude of 4.5 deg, N and a longitude of 78.0 deg, W), excluding ionospheric scintillation, using a reference ground terminal G/T of -1.0 dBi/K, an ideal ground terminal receiver, antenna diameter of 1 m, and ground terminal axial ratio of 2 dB. These parameters are provided for the performance of the broadcast link in lieu of any ideal receiver implementation.

##### 3.3.3.1.1 OPSCON Scenario

|               |                                    |
|---------------|------------------------------------|
| <b>System</b> | SYS-040-010, FT HRD/LRD Operations |
|---------------|------------------------------------|

##### 3.3.3.1.2 Data Transaction and Response

|                 |  |
|-----------------|--|
| <b>Sender</b>   | NPOESS Spacecraft                        |
| <b>Receiver</b> | NPOESS LRD-configured Field Terminal SPE |
| <b>Response</b> | None                                     |

##### 3.3.3.1.3 Data Content, Data Format, and Data Mnemonic

|                                     |  |
|-------------------------------------|--|
| <b>Data Content and Data Format</b> | The LRD data content is defined by virtual channel ID and application packet ID in the NPOESS Data Mapping, D35853. The data format includes multiple levels of encoding. The RF and pre-CCSDS protocols are specified in the Field Terminal Technical Specification, SS23-022. The CCSDS protocol layers and application packet formatting is specified in the CDFCB-X, Vol VII, D34862-07. |
| <b>Data Mnemonic</b>                | N/A  |

### 3.3.3.1.4 Protocol and Parameters

|                   |   |
|-------------------|---|
| <b>Protocol</b>   | Refer to the Field Terminal Technical Specification (SS23-0022) for the LRD-applicable downlink protocol specifications.  |
| <b>Parameters</b> | Refer to the Field Terminal Technical Specification (SS23-0022) for the LRD-applicable downlink parameter specifications. |

### 3.3.3.1.5 Data Volume and Data Rate

|                    |   |
|--------------------|---|
| <b>Data Volume</b> | N/A   |
| <b>Data Rate</b>   | The Channel Data Rate from the Spacecraft to Direct Broadcast Users of LRD occurs at 7.76 Mbps. This 7.76 Mbps rate includes overhead from Reed Solomon Encoding and randomization, convolutional encoding and prepending the Attached Sync Marker. |

The fully decoded data rate is 3.379 Mbps which is derived from the following formula:

$$\begin{aligned} \text{Fully Decoded Data Rate} &= \text{Channel Data Rate} * \text{R-S Code Rate} \\ &* \text{Convolution Code Rate} * \text{CCSDS overhead exclusive of ASM} \\ &= 7.76 \text{ Mbps} * (1/2) * (223/255) * (1020/2024) = 3.379 \text{ Mbps} \end{aligned}$$

### 3.3.3.1.6 Interface Characteristics

|                   |  |
|-------------------|--|
| <b>Frequency</b>  | The L-Band RF LRD is sent continuously at a carrier frequency of 1707 MHz. Refer to Appendix C of the NPOESS System Specification (SY15-0007) for additional characteristics of the RF link. |
| <b>Timeouts</b>   | None   |
| <b>Thresholds</b> | None   |

### 3.3.3.1.7 Security

|                                       |     |
|---------------------------------------|-----|
| <b>Client Authentication Required</b> | N/A |
| <b>Encryption Required</b>            | N/A |

### 3.3.3.1.8 Priority and Constraints

|                 |      |
|-----------------|------|
| <b>Priority</b> | None |
|-----------------|------|

**Constraints**            No retransmissions are available from the satellite

**3.3.3.1.9 Effectivity**

**Interface**            State 2 – NPP and NPOESS  
**Effectivity**            State 3 – NPOESS Only

### 3.3.3.2 NPOESS – LRD SPE Interface (Logical)

|                         |   |
|-------------------------|---|
| <b>Interface Name</b>   | NPOESS – LRD SPE Interface (Logical)  |
| <b>Interface Number</b> | X_SS_FS-LL2100  |
| <b>Description</b>      | This interface is an L-Band RF broadcast used to downlink LRD from an NPOESS satellite to any in-view FT SPE. |

#### 3.3.3.2.1 OPSCON Scenario

|               |                                    |
|---------------|------------------------------------|
| <b>System</b> | SYS-040-010, FT HRD/LRD Operations |
|---------------|------------------------------------|

#### 3.3.3.2.2 Data Transaction and Response

|                 |  |
|-----------------|--|
| <b>Sender</b>   | NPOESS Spacecraft                        |
| <b>Receiver</b> | NPOESS LRD-configured Field Terminal SPE |
| <b>Response</b> | None                                     |

#### 3.3.3.2.3 Data Content, Data Format, and Data Mnemonic

|                                     |   |
|-------------------------------------|---|
| <b>Data Content and Data Format</b> | <p>The data content is defined by virtual channel ID and application packet ID in the NPOESS Data Mapping, D35853.</p> <p>The data format includes multiple levels of encoding. The RF and pre-CCSDS protocols are specified in the Field Terminal Technical Specification, SS23-0022. The CCSDS protocol layers and application packet formatting is specified in the CDFCB-X, Volume VII, D34862-07</p> |
| <b>Data Mnemonic</b>                | Refer to Appendix E of this document for a listing of the data mnemonics associated with this interface.  |

#### 3.3.3.2.4 Protocol and Parameters

|                   |  |
|-------------------|--|
| <b>Protocol</b>   | Refer to the Field Terminal Technical Specification (SS23-0022) for the LRD-applicable downlink protocol specifications  |
| <b>Parameters</b> | Refer to the Field Terminal Technical Specification (SS23-0022) for the LRD-applicable downlink parameter specifications |

#### 3.3.3.2.5 Data Volume and Data Rate

|                    |  |
|--------------------|--|
| <b>Data Volume</b> | The maximum contact window is 13.1 minutes (786 seconds) resulting in a 331.99 MB effective data volume. The minimum contact window during which data processing occurs is 2.0 minutes (120 seconds) resulting in a 50.7 MB effective data |
|--------------------|--|

volume.

**Data Rate**

The Channel Data Rate from the Spacecraft to Direct Broadcast Users of LRD occurs at 7.76 Mbps. This 7.76 Mbps rate includes overhead from Reed Solomon Encoding and randomization, convolutional encoding and prepending the Attached Sync Marker.

The fully decoded data rate is 3.379 Mbps which is derived from the following formula:

$$\begin{aligned} \text{Fully Decoded Data Rate} &= \text{Channel Data Rate} * \text{R-S Code Rate} \\ &* \text{Convolution Code Rate} * \text{CCSDS overhead exclusive of ASM} \\ &= 7.76 \text{ Mbps} * (1/2) * (223/255) * (1020/2024) = 3.379 \text{ Mbps} \end{aligned}$$

**3.3.3.2.6 Interface Characteristics**

- Frequency** The L-Band RF LRD is sent continuously at a carrier frequency of 1707 MHz. Refer to appendix C of the NPOESS System Specification (SY15-0007) for additional characteristics of the RF link.
- Timeouts** N/A
- Thresholds** N/A

**3.3.3.2.7 Security**

- Client Authentication Required** Client Authentication is required only during SDE Mode. Refer to the Field Terminal Decryption Specification (SS23-0060) for more information regarding this mode of operation.
- Encryption Required** The NPOESS spacecraft has the ability to selectively encrypt the LRD mission data, except for A-DCS broadcast. Refer to the Field Terminal Decryption Specification (SS23-0060) for more information regarding encryption.

**3.3.3.2.8 Priority and Constraints**

- Priority** Time ordered, real-time data transmissions
- Constraints** No retransmissions are available from the satellite

**3.3.3.2.9 Effectivity**

- Interface Effectivity** State 2 – NPP and NPOESS  
State 3 – NPOESS Only



### 3.3.4 SPE – DPE Interface

#### 3.3.4.1 SPE – DPE Interface (Physical)

|                         |  |
|-------------------------|--|
| <b>Interface Name</b>   | SPE – DPE Interface (Physical)   |
| <b>Interface Number</b> | T_FS_FD-PB3000   |
| <b>Description</b>      | This interface is a file transfer mechanism using a shared landing zone directory structure (one directory per spacecraft) that is used to transfer files of HRD or LRD APs from the SPE to the DPE. |

##### 3.3.4.1.1 OPSCON Scenario

|               |                                    |
|---------------|------------------------------------|
| <b>System</b> | SYS-040-010, FT HRD/LRD Operations |
|---------------|------------------------------------|

##### 3.3.4.1.2 Data Transaction and Response

|                 |        |
|-----------------|--------|
| <b>Sender</b>   | FT SPE |
| <b>Receiver</b> | FT DPE |
| <b>Response</b> | None   |

##### 3.3.4.1.3 Data Content, Data Format, and Data Mnemonic

|                                     |  |
|-------------------------------------|--|
| <b>Data Content and Data Format</b> | <p>The HRD or LRD data content is defined by virtual channel ID and application packet ID in the NPOESS Data Mapping, D35853.</p> <p>The NPOESS HRD and LRD AP data content and format is described in the CDFCB-X Volume VII, D34862-07.</p> <p>The NPP HRD AP data content and format is described in the NPP Mission Data Format Control Book, 429-05-02-42, the NPP Command and Telemetry Handbook, document number 568423, and the NPP X-Band Data Format ICD, GSFC 429-04-02-28.</p> |
| <b>Data Mnemonic</b>                | N/A  |

##### 3.3.4.1.4 Protocol and Parameters

|                   |   |
|-------------------|---|
| <b>Protocol</b>   | File Transfer   |
| <b>Parameters</b> | SPE creates files of APs and transfers them to a shared landing zone between the SPE and DPE. There is a single directory per SCID to receive the files. The SPE transfers each file into the landing zone with a “.tmp” filename extension. Once the file transfer is complete, the SPE will rename the file by removing the “.tmp”, at which time the DPE may process the file. |

### 3.3.4.1.5 Data Volume and Data Rate

|                    |  |
|--------------------|--|
| <b>Data Volume</b> | N/A  |
| <b>Data Rate</b>   | The minimum data rate is dependent upon the maximum effective data rate of the downlink discussed in interface T_FS_FD-LB3000 of this document. Refer to the Field Terminal Technical Specification (SS23-0022) for more information.<br>HRD (NPP): 100 Mbps (min)<br>HRD (NPOESS): 100 Mbps (min)<br>LRD: 10 Mbps (min) |

### 3.3.4.1.6 Interface Characteristics

|                   |     |
|-------------------|-----|
| <b>Frequency</b>  | N/A |
| <b>Timeouts</b>   | N/A |
| <b>Thresholds</b> | N/A |

### 3.3.4.1.7 Security

|                                       |      |
|---------------------------------------|------|
| <b>Client Authentication Required</b> | None |
| <b>Encryption Required</b>            | None |

### 3.3.4.1.8 Priority and Constraints

|                    |                                  |
|--------------------|----------------------------------|
| <b>Priority</b>    | N/A                              |
| <b>Constraints</b> | Defined by physical architecture |

### 3.3.4.1.9 Effectivity

|                              |   |
|------------------------------|---|
| <b>Interface Effectivity</b> | State 2 – NPP and NPOESS<br>State 3 – NPOESS Only |
|------------------------------|---|

### 3.3.4.2 SPE – DPE Interface (Logical)

**Interface Name** SPE – DPE Interface (Logical)  
**Interface Number** T\_FS\_FD-LB3000  
**Description** This interface provides for the transfer of Application Packets containing mission data and MSD from the SPE to the DPE.

#### 3.3.4.2.1 OPSCON Scenario

**System** SYS-040-010, FT HRD/LRD Operations

#### 3.3.4.2.2 Data Transaction and Response

**Sender** Field Terminal SPE  
**Receiver** Field Terminal DPE  
**Response** N/A

#### 3.3.4.2.3 Data Content, Data Format, and Data Mnemonic

**Data Content and Data Format** NPOESS AP data is described in the NPOESS Common Data Format Control Book – External (CDFCB-X), D34862. NPP HRD AP data is described in the NPP Mission Data Format Control Book, 429-05-02-42, the NPP Command and Telemetry Handbook, document number 568423, and the NPP X-Band Data Format ICD, GSFC 429-04-02-28. Refer to the NPOESS Data Mapping, D35853, for more information on the correlation between the VCIDs and APIDs.

**Data Mnemonic** Refer to Appendix E of this document for a listing of the data mnemonics associated with this interface.

#### 3.3.4.2.4 Protocol and Parameters

**Protocol** File Transfer  
**Parameters** The SPE provides HRD/LRD to the DPE channelized by SCID. This is accomplished by writing files of APs to a pre-determined landing zone visible to both the SPE and DPE. The following shows the directory hierarchy used for the landing zone:

<common node>\<scid>

### 3.3.4.2.5 Data Volume and Data Rate

**Data Volume** Data Volume is dependent on the duration of the spacecraft contact and whether the received downlink is HRD or LRD. The maximum contact length of the SPE with the satellite is 13.1 minutes. Refer to the Field Terminal Technical Specification (SS23-0022) for more information.

The data volumes listed here are volumes for the fully decoded data.

HRD (NPP): 1.28 GB (max) per contact (based on an information rate of 13.066 Mbps)

HRD (NPOESS): 1.71 GB (max) per contact (based on an information rate of 17.422 Mbps)

LRD: 331.99 MB (max) per contact (based on an information rate of 3.379 Mbps)

**Data Rate** The transfer rate shall not exceed the downlink effective data rate. Refer to the Field Terminal Technical Specification (SS23-0022) for more information.

HRD (NPP): Fully decoded information rate = 13.066 Mbps

HRD (NPOESS): Fully decoded information rate = 17.422 Mbps

LRD: Fully decoded information rate = 3.379 Mbps

### 3.3.4.2.6 Interface Characteristics

**Frequency** User and location dependent. There are a maximum of 28 satellite contacts for a 2-satellite NPOESS constellation during any 24-hour period. Refer to the Field Terminal Technical Specification (SS23-0022) for more information.

**Timeouts** N/A

**Thresholds** N/A

### 3.3.4.2.7 Security

**Client Authentication Required** N/A

**Encryption Required** N/A

### 3.3.4.2.8 Priority and Constraints

**Priority** APs are sent by the SPE to the DPE as soon as they are

completed.

**Constraints**

Only completed APs will be streamed from the SPE to the DPE. Incomplete APs will be discarded by the SPE (not forwarded to DPE). Note: The SPE does not place fill data in the APs.. Refer to the Field Terminal Technical Specification (SS23-0022) for more information.

**3.3.4.2.9 Effectivity**

**Interface  
Effectivity**

State 2 - NPP and NPOESS  
State 3 - NPOESS Only

### 3.3.5 FT – MSDS Interface

#### 3.3.5.1 FT – MSD External Interface (Physical)

**Interface Name** FT – MSD External Interface (Physical)

**Interface Number** X\_MS\_FT-PB4000

**Description** This interface serves as the Internet connection between the FT and the external source of MSD. The external source of MSD may be the E-MSDS or another user-specified source of MSD. This interface addresses the connections between the SPE-to-MSDS and the DPE-to-MSDS. Both physical interfaces are identical.

Note: Field terminals are functionally able to obtain MSD from sources other than the MSDS. However, if an alternate source is used for the retrieval of MSD, that provider must adhere to the requirements of this interface. Failure to do so will cause the data to be unusable by the FT.

##### 3.3.5.1.1 OPSCON Scenario

**System** SYS-040-010, FT HRD/LRD Operations  
SYS-040-040, FT MSD Operations

##### 3.3.5.1.2 Data Transaction and Response

**Sender** NPOESS E-MSDS or other user-specified source of MSD

**Receiver** FT with internet connectivity

**Response** N/A

##### 3.3.5.1.3 Data Content, Data Format, and Data Mnemonic

**Data Content and Data Format** N/A

**Data Mnemonic** N/A

##### 3.3.5.1.4 Protocol and Parameters

**Protocol** TCP/IP

**Parameters** Refer to interface X\_NP\_NU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01 for additional information that affects this interface.

##### 3.3.5.1.5 Data Volume and Data Rate

**Data Volume** N/A

**Data Rate** Dependent upon the resources available to the FT. A minimum of 100 Mbps is recommended.

**3.3.5.1.6 Interface Characteristics**

**Frequency** N/A

**Timeouts** N/A

**Thresholds** N/A

**3.3.5.1.7 Security**

**Encryption Required** N/A

**Physical Security** N/A

**3.3.5.1.8 Priority and Constraints**

**Priority** There is no prioritization of data or users for this interface, except as handled by the transfer protocol.

**Constraints** This interface is only effective if the location of the FT allows for a network connection.

The E-MSDS supports a maximum of 50 concurrent requests.

**3.3.5.1.9 Effectivity**

**Interface** State 2 - NPP and NPOESS

**Effectivity** State 3 – NPOESS Only

### 3.3.5.2 FT – MSD External Interface (Logical)

**Interface Name** FT – MSD External Interface (Logical)

**Interface Number** X\_MS\_FT-LB4000

**Description** This interface addresses the connections between the SPE and the MSDS and between the DPE and the MSDS.

The SPE – MSDS connection provides a means for the SPE Data Acquisition Subsystem (Satellite Scheduler) to access TLE data updates.

The DPE – MSDS connection is used to obtain updated MSD via an FTP pull initiated by the FT and placed on the DPE ingest landing zone. The FT checks the status of the MSD located on the MSDS before each scheduled satellite pass. Any data more recent than the corresponding data currently on the DPE needs to be retrieved. The time delta between the data pull from the MSDS and the beginning of a pass is selected by the FT operator and may need to be adjusted based on the bandwidth of the connection. Refer to interface X\_NP\_NU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01 for details related to data available to the FT via the E-MSDS.

Note: The DPE software does not automatically pull the data from the MSDS. It is up to the FT to perform this by a manual means or to produce software to enable automatic retrieval of MSD from the MSDS. This interface provides the connectivity for the DPE Operator to pull the data from the MSDS to the DPE ingest landing zone.

#### 3.3.5.2.1 OPSCON Scenario

**System** SYS-040-010, FT HRD/LRD Operations  
SYS-040-040, FT MSD Operations

#### 3.3.5.2.2 Data Transaction and Response

**Sender** External MSD source

**Receiver** FT with internet connectivity

**Response** N/A

#### 3.3.5.2.3 Data Content, Data Format, and Data Mnemonic

**Data Content and Data Format** Refer to interface X\_NP\_NU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01 for information about the data content. Specifically, see Table 3.3.2-1, IDPS/E-MSDS Data, for a list of data that will be available for download from the E-MSDS.



Refer to the NPOESS CDFCB-X Volume VI, Ancillary Data, Auxiliary Data, Messages, and Reports, D34862-06, for information about the data format.

**Data Mnemonic** Refer to interface X\_NP\_NU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01.

#### 3.3.5.2.4 Protocol and Parameters

**Protocol** Anonymous FTP: DPE initiated pull  
HTTP: External user initiates access to Web site

**Parameters** The source of MSD is configured by the FTO.  
FTP: Valid IP address and directories -  
ftp://msds.npoess.noaa.gov  
HTTP-S: Valid Web address - https://msds.npoess.noaa.gov  
The external users retrieve the data from a configurable directory (configured in controlled software release) location specified for each data type. The filenames and locations for each data item currently posted are listed in the IDPS/E-MSDS Data List file and are maintained by the IDPS/MSDS File Management software. Users can download the current versions of the IDPS/E-MSDS Data List and identify the files that they need to download.  
Refer to interface X\_NP\_FU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01, Section 3.3.2, for configuration information and additional parameters that affect this interface.

#### 3.3.5.2.5 Data Volume and Data Rate

**Data Volume** Refer to the NPOESS Volume VI, Ancillary Data, Auxiliary Data, Messages, and Reports, D34862-06 for individual file sizes.

**Data Rate** N/A

#### 3.3.5.2.6 Interface Characteristics

**Frequency** Refer to interface X\_NP\_NU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01.

**Timeouts** Refer to interface X\_NP\_NU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01.

**Thresholds** Refer to interface X\_NP\_NU-LM0020 in the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01.

#### 3.3.5.2.7 Security

**Client Authentication Required** N/A

**Encryption  
Required** N/A

**3.3.5.2.8 Priority and Constraints**

**Priority** There is no prioritization of data or users for this interface, except as handled by the transfer protocol.

**Constraints** Users have read only privileges to access posted data.

**3.3.5.2.9 Effectivity**

**Interface** State 2 - NPP and NPOESS

**Effectivity** State 3 – NPOESS Only

### 3.3.6 DPE – MAE Interface

The logical interfaces associated with the single physical interface described in this section can be physically separated and/or duplicated. This can be done by duplicating the physical interface and then using the duplicated interface to carry the data of one or more of the logical interfaces. This allows for many different hardware implementations.

#### 3.3.6.1 DPE – MAE Network Connection (Physical)

|                         |  |
|-------------------------|--|
| <b>Interface Name</b>   | DPE – MAE Network Connection (Physical)  |
| <b>Interface Number</b> | X_FM_FD-PB5000   |
| <b>Description</b>      | The DPE – MAE Interface provides a bi-directional flow of information between the DPE and the MAE allowing the MAE User to request and receive desired data products.<br>Refer to the NPOESS Application Programming Interface (API) User's Guide, D41044, for information on the Data Delivery GUIs and APIs. |

##### 3.3.6.1.1 OPSCON Scenario

|               |                                    |
|---------------|------------------------------------|
| <b>System</b> | SYS-040-010, FT HRD/LRD Operations |
|---------------|------------------------------------|

##### 3.3.6.1.2 Data Transaction and Response

|                 |        |
|-----------------|--------|
| <b>Sender</b>   | FT DPE |
| <b>Receiver</b> | FT MAE |
| <b>Response</b> | N/A    |

##### 3.3.6.1.3 Data Content, Data Format, and Data Mnemonic

|                                     |     |
|-------------------------------------|-----|
| <b>Data Content and Data Format</b> | N/A |
| <b>Data Mnemonic</b>                | N/A |

##### 3.3.6.1.4 Protocol and Parameters

|                   |   |
|-------------------|---|
| <b>Protocol</b>   | TCP/IP or as defined by the procuring agency.   |
| <b>Parameters</b> | The MAE establishes a TCP/IP connection for S-FTP traffic from the DPE via a client-server relationship for the transmission of data. The DPE acts as the Server. |

### 3.3.6.1.5 Data Volume and Data Rate

|                    |  |
|--------------------|--|
| <b>Data Volume</b> | N/A  |
| <b>Data Rate</b>   | The data rate is dependent upon the type of transmission media implemented by the FT user/procuring agency, the data volume and the required timeliness of the requested data product. A minimum of 100 Mbps is recommended. |

### 3.3.6.1.6 Interface Characteristics

|                   |  |
|-------------------|--|
| <b>Frequency</b>  | N/A  |
| <b>Timeouts</b>   | There are no timeouts across this interface, except as implemented by the transfer protocol. |
| <b>Thresholds</b> | N/A  |

### 3.3.6.1.7 Security

|                                       |     |
|---------------------------------------|-----|
| <b>Client Authentication Required</b> | N/A |
| <b>Encryption Required</b>            | N/A |

### 3.3.6.1.8 Priority and Constraints

|                    |   |
|--------------------|---|
| <b>Priority</b>    | There is no prioritization of data or users for this interface, except as handled by the transfer protocol. |
| <b>Constraints</b> | N/A   |

### 3.3.6.1.9 Effectivity

|                              |   |
|------------------------------|---|
| <b>Interface Effectivity</b> | State 2 - NPP and NPOESS<br>State 3 – NPOESS Only |
|------------------------------|---|

### 3.3.6.2 DPE – MAE Deliverable Data Product Request (Logical)

**Interface Name** DPE – MAE Deliverable Data Product Request (Logical)  
**Interface Number** X\_FM\_FD-LB5000  
**Description** See the NPOESS Common Interfaces and Services ICD Volume I – External, D34659-01, Section 3.5.1, Deliverable Data Query and Request, for more detail.

#### 3.3.6.2.1 OPSCON Scenario

**System** SYS-040-010, FT HRD/LRD Operations

#### 3.3.6.2.2 Data Transaction and Response

**Sender** Field Terminal MAE  
**Receiver** Field Terminal DPE  
**Response** The responses to all types of requests are described by interface X\_FD\_FM-LB5100 DPE – MAE Deliverable Data Product Request Status.

#### 3.3.6.2.3 Data Content, Data Format and Data Mnemonic

**Data Content and Data Format** **Catalog Request**  
Requests on the data catalog contain the URID.  
**Catalog Query**  
Query specifications options are: data product, sensor, and spacecraft.  
Optional query specifications are effectivity and geospatial subsetting.  
Refer to the NPOESS Application Programming Interface (API) User's Guide, D41044, for information on the Data Delivery GUIs and APIs.  
**Data Mnemonic** N/A

#### 3.3.6.2.4 Protocol and Parameters

**Protocol** Remote users  
Authorized User initiates access to Network via established procedures implemented by each Field Terminal.  
**Parameters** **GUI**  
The GUI interface may be implemented directly via a script command or, if applicable for a specific Field Terminal, using

the COTS software, Citrix Presentation Server.

### **API**

The API uses the NPOESS API libraries that encapsulate all the necessary intersystem communication protocols. All the information needed to configure the API libraries for access to NPOESS is included in the NPOESS Application Programming Interface (API) User's Guide, D41044.

#### **3.3.6.2.5 Data Volume and Data Rate**

**Data Volume** The data volume is 1024 bytes per transaction plus 400 bytes per data product requested (standing or ad hoc), per data product request modification, per status request.

**Data Rate** Limited by the physical properties of this interface, section 3.3.6.1.

#### **3.3.6.2.6 Interface Characteristics**

**Frequency** User initiates data queries and requests on an as needed basis.

#### **Timeouts**

### **GUI**

If the GUI interface does not return an appropriate response within 30 seconds (DPE configurable), the GUI displays a notification that it has timed out and the user should re-issue the command.

### **API**

Communications timeout is set by the user's environment, the default setting is 30 seconds.

The DPE installation default for the keep-alive timeout is set for 5 seconds.

**Thresholds** Upon user request

#### **3.3.6.2.7 Security**

**Client Authentication Required** N/A

**Encryption Required** N/A

#### **3.3.6.2.8 Priority and Constraints**

**Priority** N/A

## Constraints

### Catalog Requests

A onetime delivery only of a single data item that is shown to be available in a catalog query

No aggregations are available

Packaging is always on

The Repaired Granules option is not available

### Catalog Queries

Catalog queries return up to a configurable maximum number of items found.

### GUI

The GUI administrator may impose limits on the number of concurrent users. A user may log in once under a given User-Role combination at a time.

User accounts may be created with different roles, such as 'user' or 'administrator'. A user may log in once under a given User-Role combination at any time.

Data available for request is restricted based on user role.

### API

The number of APIs that can be opened concurrently is configurable at each site depending on the resources available.

#### 3.3.6.2.9 Effectivity

##### Interface Effectivity

State 2 – NPP and NPOESS

State 3 – NPOESS Only

### 3.3.6.3 DPE – MAE Deliverable Data Product Request Status (Logical)

**Interface Name** DPE – MAE Deliverable Data Product Request Status (Logical)

**Interface Number** X\_FD\_FM-LB5100

**Description** The Deliverable Data Query and Request Status is a response with a status message returned for each of the four types of requests made via the DPE – MAE Deliverable Data Product Request Interface, X\_FM\_FD–LB5000.

This request status is sent automatically as a response to a data query and request. The mechanism (GUI or API) to which the status message is sent is specified in the individual account setup.

#### 3.3.6.3.1 OPSCON Scenario

**System** SYS-040-010, FT HRD/LRD Operations

#### 3.3.6.3.2 Data Transaction and Response

**Sender** Field Terminal DPE

**Receiver** Field Terminal MAE

**Response** N/A

#### 3.3.6.3.3 Data Content, Data Format and Data Mnemonic

**Data Content and Data Format** The following data content is transferred across this interface and pertain to all three interface mechanisms; GUI, API and JMS API:

- Response containing catalog query results (a list of the products currently available to the user that corresponds to the query specification and a subset of its metadata)
- Response containing status of requests for data delivery (a status of the request including all parameters that define the current request and date of last request modification)
- Response containing status of request for modifications of existing data delivery requests (a status message similar to that for an original data delivery request status message)

The response to a data delivery request contains the following status for all three interface mechanisms:

- Request received
- Processing begun
- Processing complete



- Success/Error/Messages
- Destination and location of the data delivered

Status messages with identical content are optionally returned via Deliverable Data Automated Notification (user must provide an email destination as part of the original request). The Deliverable Data Automated Notification interface is discussed further in interface, DPE – MAE Deliverable Data Automated Notification. Refer to the NPOESS Application Programming Interface (API) User’s Guide, D41044, for information on the Data Delivery GUIs and APIs.

**Data Mnemonic** N/A

### 3.3.6.3.4 Protocol and Parameters

**Protocol** Remote users:  
Authorized User initiates access to Network via established procedures implemented by each Field Terminal

**Parameters** **GUI**  
The GUI interface may be implemented directly via a script command or, if applicable for a specific Field Terminal, using the COTS software, Citrix Presentation Server  
**API**  
The API uses the NPOESS API libraries to encapsulate all of the necessary intersystem communication protocols. All the information needed to configure the API libraries for access to NPOESS is included in the NPOESS Application Programming Interface (API) User’s Guide, D41044.

### 3.3.6.3.5 Data Volume and Data Rate

**Data Volume** The volume of a data delivery status message transferred from the DPE to the MAE is 1024 bytes per message plus 400 bytes per product reported on.

**Data Rate** Limited by the physical properties of this interface, section 3.3.6.1.

### 3.3.6.3.6 Interface Characteristics

**Frequency** As needed to respond to each user request

**Timeouts** **GUI**  
If the GUI interface does not return an appropriate response within 30 seconds (DPE configurable), the user should re-issue the command.

### API

Communications timeout is set by the user's environment (DPE default is 30 seconds).

The DPE installation default for keep-alive timeout is set for 5 seconds

### Thresholds

Status messages are issued when there is a change in state of the request, in response to a request modification or when the user submits a request for status update via the Data Delivery GUI.

#### 3.3.6.3.7 Security

**Client Authentication Required** N/A

**Encryption Required** N/A

#### 3.3.6.3.8 Priority and Constraints

**Priority** N/A

**Constraints** **GUI**

The GUI imposes a limit of 20 concurrent users. Procedurally; 6 allocated to NPOESS operations users and 14 allocated to External users.

The DPE can respond to a number of requests limited only by the available system resources.

Up to 20 GUI user logins at a time are supported at a single DPE. A user may be logged in once under a given User-Role combination at a time.

### API

The number of APIs that can be opened concurrently is configurable at each site depending on the resources available.

#### 3.3.6.3.9 Effectivity

**Interface Effectivity** State 2 – NPP and NPOESS  
State 3 – NPOESS Only

### 3.3.6.4 DPE – MAE Deliverable Data Products (Logical)

**Interface Name** DPE – MAE Deliverable Data Products (Logical)

**Interface Number** X\_FD\_FM-LB5200

**Description** The deliverable data products generated by the DPE consist of

- RDRs.
- SDRs.
- TDRs.
- EDRs.
- ARPs.
- Deliverable Intermediate Products (IPs).

The formats of these products are specified in the NPOESS Common Data Format Control Book-External (CDFCB-X), D36862, within the following volumes: Volume II, D34862-02 (RDRs), Volume III, D34862-03 (SDRs/TDRs), Volume IV, D34862-04 (EDRs/IPs/ARPs), and Volume V, D34862-05 (metadata). Metadata is generated for all deliverable data products and is included in the HDF5 files delivered to the MAE.

This interface delivers the deliverable data products to the MAE. The DPE provides the MAE a notification of transfer completion via a status message in the GUI or the API or an automated notification. (See Section 3.3.6.3, interface X\_FD\_FM-LB5100). Additionally, the DPE provides a Data Delivery Report, summarizing the data delivered (see Section 3.3.6.5, interface X\_FD\_FM-LB5300).

#### 3.3.6.4.1 OPSCON Scenario

**System** SYS-040-010, FT HRD/LRD Operations

#### 3.3.6.4.2 Data Transaction and Response

**Sender** Field Terminal DPE

**Receiver** Field terminal MAE

**Response** N/A

#### 3.3.6.4.3 Data Content, Data Format and Data Mnemonic

**Data Content** Content and format descriptions for deliverable data products are provided in the NPOESS Common Data Format Control Book-

**and Data Format** External (CDFCB-X), D36862, within the following volumes: Volume II, D34862-02 (RDRs), Volume III, D34862-03 (SDRs/TDRs), Volume IV, D34862-04 (EDRs/IPs/ARPs), Volume V, D34862-05 (Metadata), and Volume VI, D34862-06 (Anc, Aux, Messages and Reports).

**Data Mnemonic** Refer to Appendix F of this document for a listing of the data mnemonics associated with this interface

#### 3.3.6.4.4 Protocol and Parameters

**Protocol** Shared disk or S-FTP: DPE initiates push

**Parameters** The DPE pushes the data to a directory location specified by the procuring agency.

#### 3.3.6.4.5 Data Volume and Data Rate

**Data Volume** The amount of data delivered to the MAE is dependent upon the data products selected by the user. Refer to the Field Terminal Technical Specification (SS23-0022) for maximum data volumes.

**Data Rate** Limited by the physical properties of this interface, section 3.3.6.1.

#### 3.3.6.4.6 Interface Characteristics

**Frequency** Interface activity can occur at any time based upon standing or ad-hoc user requests for products. Refer to the Field Terminal Technical Specification (SS23-0022) for additional information.

**Timeouts** There are no timeouts across this interface, except as implemented by the transfer protocol. Should the connection fault, the DPE retries every 30 seconds (configurable value) until the transfer is re-established or for up to 10 (configurable value) attempts. After these retries have been made, a message will be sent to the DPE operator, indicating the fault. The retries will then continue indefinitely every 180 seconds (configurable value) with fault messages sent to the DPE operator after each attempt. The configurable values identified here are fixed at system installation time.

**Thresholds** All data transfers from the DPE to the MAE are the result of requests submitted by the MAE. These request specifications determine the thresholds for data distribution.

#### 3.3.6.4.7 Security

**Client Authentication** N/A

**Required**

**Encryption Required** N/A

**3.3.6.4.8 Priority and Constraints**

**Priority** Prioritization scheme for data delivery requests is based on the following data request inputs:

Role – the role of the user making the request. Roles are assigned values (configurable by the FT Operator) from 1 to 100, where 100 is the highest priority.

Data – the data being requested (e.g., RDRs, SDRs, TDRs, EDRs, ARPs, and IPs) are assigned values (configurable by the FT Operator) from 1 to 10, with 10 being the highest priority. Data requests of equal priority are handled in the order of next execution start time.

An example of roles and their corresponding values are identified as follows:

| <u>Role</u>              | <u>Value</u> |
|--------------------------|--------------|
| 1. Role 1 Operations     | 100          |
| 2. Role 1 Administration | 50           |
| 3. Role 2 Operations     | 80           |
| 4. Role 2 Administration | 20           |
| 5. Role 3 Operations     | 60           |

An example of data and their corresponding values are identified as follows:

| <u>Data</u>             | <u>Value</u> |
|-------------------------|--------------|
| 1. VIIRS-NCC-EDR_NPOESS | 10           |
| 2. VIIRS-SST-EDR_NPOESS | 10           |
| 3. TLE-AUX_NPOESS       | 8            |

**Constraints** The DPE can respond to a number of requests limited only by the available system resources.

**3.3.6.4.9 Effectivity**

**Interface Effectivity** State 2 – NPP and NPOESS  
State 3 – NPOESS Only

### 3.3.6.5 DPE – MAE Data Delivery Report (Logical)

**Interface Name** DPE – MAE Data Delivery Report (Logical)

**Interface Number** X\_FD\_FM-LB5300

**Description** The DDR is a report of all the file transfers, successful and failed, via the respective delivery of Deliverable Data Interface (requested via the DPE – MAE Data Requests Interface). The report contains information about the distributed data including: filename, directory location, and other format information as defined in the NPOESS CDFCB-X, Volume VI, D34862-06. The DDR is produced describing the data delivered either over a pre-defined time period (e.g., all products delivered in the past 15 minutes) or when the number of products delivered reaches a threshold, whichever comes first.

The DDR identifies the data that is delivered to a particular delivery destination and the delivery status. The DDR is delivered via the same means and to the same directory destination as the data it is reporting.

#### 3.3.6.5.1 OPSCON Scenario

**System** SYS-040-010, FT HRD/LRD Operations  
SYS-030-040, System Status and Reporting User Interface Operations

#### 3.3.6.5.2 Data Transaction and Response

**Sender** Field Terminal DPE

**Receiver** Field Terminal MAE

**Response** N/A

#### 3.3.6.5.3 Data Content, Data Format and Data Mnemonic

**Data Content and Data Format** The DDR is an XML formatted file. The details for this format are defined in the NPOESS CDFCB-X, Volume VI, D34862-06, Section 4.2.

Configuration parameters - The DDR provides a summary description of the data files that have been transferred to a particular destination. The DDR contains the RequestID associated with the data request, the directory to which the products are transferred, the filenames of each file transferred (successful and failed) and the completion time of each file

delivered.

**Data Mnemonic** DP\_NU-L00050-000

#### 3.3.6.5.4 Protocol and Parameters

**Protocol** S-FTP: DPE initiates push (available during the NPOESS time frame only)

**Parameters** S-FTP: Valid IP address, username and password (available during the NPOESS time frame only)

#### 3.3.6.5.5 Data Volume and Data Rate

**Data Volume** Data volume varies based on amount of data requested and sent. The report file size is detailed in NPOESS CDFCB-X Volume VI, D34862-06, Section 4.2

**Data Rate** Limited by the physical properties of this interface, section 3.3.6.1.

#### 3.3.6.5.6 Interface Characteristics

**Frequency** The DDR frequency is based on two DPE configurable parameters:

- Specific number of product deliveries to the destination
- Specific time interval from last DDR (or initiation)

As soon as one of the above parameters is met, a DDR is sent.

**Timeouts** The S-FTP utility is configured to timeout if the DPE is unable to establish or re-establish a connection within 30 seconds. Should the S-FTP connection fault, the DPE retries the transfer every 30 seconds (configurable value) until the transfer is established for up to 3 (configurable value) attempts. After these retries have been made, a message is sent to the FT Operator indicating the fault. The configurable values identified here are set at system installation time.

**Thresholds** As the specified number of products is delivered or the specified time interval expires.

#### 3.3.6.5.7 Security

**Client Authentication Required** N/A

**Encryption Required** N/A

**3.3.6.5.8 Priority and Constraints**

**Priority** N/A

**Constraints** N/A

**3.3.6.5..9 Effectivity**

**Interface** State 2 – NPP and NPOESS

**Effectivity** State 3 – NPOESS Only



### 3.3.6.6 DPE – MAE Deliverable Data Automated Notification (Logical)

**Interface Name** DPE – MAE Deliverable Data Automated Notification (Logical)

**Interface Number** X\_FD\_FM-LB5400

**Description** The DPE sends automated notification messages concerning general data delivery status at user option. When the MAE User issues a data delivery request. If this option is selected, the Deliverable Data Automated Notification is sent to an email address specified by the requestor. This notification informs the user that there was an attempt to send the data and whether or not the attempt was successful.

#### 3.3.6.6.1 OPSCON Scenario

**System** SYS-040-010, FT HRD/LRD Operations

#### 3.3.6.6.2 Data Transaction and Response

**Sender** Field Terminal DPE

**Receiver** Field Terminal MAE

**Response** N/A

#### 3.3.6.6.3 Data Content, Data Format and Data Mnemonic

**Data Content and Data Format** The description of the content and format of these deliverable data automated notification messages are described in CDFCB – X, Volume VI, D34862-06, Section 4.3.

**Data Mnemonic** DP\_NU-L00060-000

#### 3.3.6.6.4 Protocol and Parameters

**Protocol** SMTP – standard TCP/IP ports

**Parameters** N/A – one of several standard message types sent to users depending only on the user selecting this service.

#### 3.3.6.6.5 Data Volume and Data Rate

**Data Volume** Data volume varies based on amount of data requested and sent. The notification file size is approximated in NPOESS CDFCB-X Volume VI, D34862-06, Section 4.3

**Data Rate** Limited by the physical properties of this interface, section 3.3.6.1.

#### 3.3.6.6.6 Interface Characteristics

**Frequency** Upon user request

**Timeouts** There are no timeout conditions.

**Thresholds** Messages are sent if the user requests this service and when the criteria that cause this message to be sent are met.

**3.3.6.6.7 Security**

**Client Authentication Required** N/A

**Encryption Required** N/A

**3.3.6.6.8 Priority and Constraints**

**Priority** N/A

**Constraints** Messages are sent only to users who have requested this service, have an email server configured to receive the email, and have configured the DPE to interact with the email server.

**3.3.6.6.9 Effectivity**

**Interface Effectivity** State 2 – NPP and NPOESS  
State 3 – NPOESS Only

### 3.3.7 Field Terminal Operator – DPE Interface

#### 3.3.7.1 Field Terminal Operator – DPE (Physical)

**Interface Name** FT Operator – DPE (Physical)  
**Interface Number** X\_FO\_FD-PB6000  
**Description** This interface provides a bi-directional flow of information allowing the Field Terminal Operator (FTO) to access and interact with the FT system DPE via a graphical display and standard input devices.

##### 3.3.7.1.1 OPSCON Scenario

**System** SYS-040-010, FT HRD/LRD Operations

##### 3.3.7.1.2 Data Transaction and Response

**Sender** Field Terminal Operator  
**Receiver** Field Terminal DPE  
**Response** N/A

##### 3.3.7.1.3 Data Content, Data Format, and Data Mnemonic

**Data Content and Data Format** N/A  
**Data Mnemonic** N/A

##### 3.3.7.1.4 Data Transfer, Protocol, and Parameters

**Protocol** Ethernet  
**Parameters** N/A

##### 3.3.7.1.5 Data Volume and Data Rate

**Data Volume** N/A  
**Data Rate** The data rate is based on the number and size of the operator interactions and activities.

### 3.3.7.1.6 Interface Characteristics

|                   |  |
|-------------------|--|
| <b>Frequency</b>  | Interface activity can occur at any time based upon operator initiated actions and requests. |
| <b>Timeouts</b>   | N/A  |
| <b>Thresholds</b> | N/A  |

### 3.3.7.1.7 Security

|                                       |     |
|---------------------------------------|-----|
| <b>Client Authentication Required</b> | N/A |
| <b>Encryption Required</b>            | N/A |

### 3.3.7.1.8 Priority and Constraints

|                    |     |
|--------------------|-----|
| <b>Priority</b>    | N/A |
| <b>Constraints</b> | N/A |

### 3.3.7.1.9 Effectivity

|                              |   |
|------------------------------|---|
| <b>Interface Effectivity</b> | State 2 – NPP and NPOESS<br>State 3 – NPOESS Only |
|------------------------------|---|

### 3.3.7.2 Field Terminal Operator – DPE (Logical)

|                         |   |
|-------------------------|---|
| <b>Interface Name</b>   | FT Operator – DPE (Logical)   |
| <b>Interface Number</b> | X_FO_FD-LB6000  |
| <b>Description</b>      | <p>This interface provides the means for the FTO to access and interact with the FT system DPE. The following GUIs are used by the FTO in order to configure the subsystems of the DPE.</p> <ul style="list-style-type: none"><li>• FT Operator Display</li><li>• Offline Log Display</li><li>• Chain Display</li><li>• MSD Selection Interface</li><li>• Inventory GUI</li><li>• System Monitor and Control Manager GUI</li></ul> <p>Refer to the NPOESS Application Programming Interface (API) User's Guide, D41044, for information on the Data Delivery GUIs and APIs.</p> |

#### 3.3.7.2.1 OPSCON Scenario

|               |                                    |
|---------------|------------------------------------|
| <b>System</b> | SYS-040-010, FT HRD/LRD Operations |
|---------------|------------------------------------|

#### 3.3.7.2.2 Data Transaction and Response

|                 |                                    |
|-----------------|------------------------------------|
| <b>Sender</b>   | Field Terminal Operator            |
| <b>Receiver</b> | Field Terminal DPE                 |
| <b>Response</b> | Current DPE configuration settings |

#### 3.3.7.2.3 Data Content, Data Format, and Data Mnemonic

|                                     |   |
|-------------------------------------|---|
| <b>Data Content and Data Format</b> | Refer to the NPOESS Application Programming Interface (API) User's Guide, D41044, for information on the Data Delivery GUIs and APIs. |
| <b>Data Mnemonic</b>                | Refer to the NPOESS Application Programming Interface (API) User's Guide, D41044, for information on the Data Delivery GUIs and APIs. |

#### 3.3.7.2.4 Protocol and Parameters

|                 |  |
|-----------------|--|
| <b>Protocol</b> | The GUI Interfaces will be implemented using terminal server client metaframe COTS software. This utility provides the capability to remotely access the DPE. The protocol for this mechanism is entirely contained within the COTS terminal server package. |
|-----------------|--|

**Parameters** Parameter specifications for each GUI are contained within its respective user guide or manual.

### 3.3.7.2.5 Data Volume and Data Rate

**Data Volume** The data volume is based on the number and size of the operator interactions and activities.

**Data Rate** The data rate is based on the number and size of the operator interactions and activities.

### 3.3.7.2.6 Interface Characteristics

**Frequency** Interface activity can occur at any time based upon operator-initiated actions.

**Timeouts** Timeouts on the GUI interfaces and the handling of those conditions are defined in the GUI User's Guide or by the acquiring agency.

**Thresholds** Any thresholds involving this interface are handled by the individual GUIs

### 3.3.7.2.7 Security

**Client Authentication Required** Acquiring agency defined, generally implemented via the operating system security features (username and password)

**Encryption Required** N/A

### 3.3.7.2.8 Priority and Constraints

**Priority** N/A

**Constraints** Operations are not prioritized.  
Refer to the appropriate user guide or manual, discussed in section 3.3.7.2.3 of this document, for more information regarding the GUIs used for this interface.

### 3.3.7.2.9 Effectivity

**Interface Effectivity** State 2 – NPP and NPOESS  
State 3 – NPOESS Only

### 3.3.8 SPE – NPOESS Certificate Directory (NCD) Interface

#### 3.3.8.1 SPE – NCD Interface (Physical)

|                         |   |
|-------------------------|---|
| <b>Interface Name</b>   | SPE – NCD Interface (Physical)  |
| <b>Interface Number</b> | X_NP_FS-PB0100  |
| <b>Description</b>      | <p>This interface serves as the Internet connection between the FT and the NPOESS Certificate Directory. The FT retrieves the following NPOESS public Certificates:</p> <ul style="list-style-type: none"><li>• NPOESS Digital Signature Key Certificate</li><li>• NPOESS Key Agreement Key Certificate</li></ul> <p>This interface addresses the connections between the SPE-to-NCD.</p> |

#### 3.3.8.1.1 OPSCON Scenario

|               |                                       |
|---------------|---------------------------------------|
| <b>System</b> | SYS-020-070 Selective Data Encryption |
|---------------|---------------------------------------|

#### 3.3.8.1.2 Data Transaction and Response

|                 |                               |
|-----------------|-------------------------------|
| <b>Sender</b>   | NPOESS Certificate Directory  |
| <b>Receiver</b> | FT with internet connectivity |
| <b>Response</b> | N/A                           |

#### 3.3.8.1.3 Data Content, Data Format, and Data Mnemonic

|                                     |   |
|-------------------------------------|---|
| <b>Data Content and Data Format</b> | <p>NPOESS Digital Signature Certificate (X.509 Certificate Standard). The certificate is comprised of an encrypted digital signature and clear text message including the public key.</p> <p>NPOESS Key Agreement Certificate (X.509 Certificate Standard). The certificate is comprised of an encrypted digital signature and clear text message including the public key.</p> |
| <b>Data Mnemonic</b>                | N/A   |

#### 3.3.8.1.4 Data Transfer, Protocol, and Parameters

|                   |     |
|-------------------|-----|
| <b>Protocol</b>   | N/A |
| <b>Parameters</b> | N/A |

### 3.3.8.1.5 Data Volume and Data Rate

|                    |   |
|--------------------|---|
| <b>Data Volume</b> | N/A   |
| <b>Data Rate</b>   | Dependent upon the resources available to the FT. A minimum of 10 Mbps is recommended |

### 3.3.8.1.6 Interface Characteristics

|                   |     |
|-------------------|-----|
| <b>Frequency</b>  | N/A |
| <b>Timeouts</b>   | N/A |
| <b>Thresholds</b> | N/A |

### 3.3.8.1.7 Security

|                                       |     |
|---------------------------------------|-----|
| <b>Client Authentication Required</b> | N/A |
| <b>Encryption Required</b>            | N/A |

### 3.3.8.1.8 Priority and Constraints

|                    |   |
|--------------------|---|
| <b>Priority</b>    | There is no prioritization of data or users for this interface, except as handled by the transfer protocol. |
| <b>Constraints</b> | This interface is only effective if the location of the FT allows for an internet connection.               |

### 3.3.8.1.9 Effectivity

|                              |  |
|------------------------------|--|
| <b>Interface Effectivity</b> | State 2 – NPOESS Only<br>State 3 – NPOESS Only |
|------------------------------|--|



### 3.3.8.2 SPE – NCD Interface (Logical)

|                         |   |
|-------------------------|---|
| <b>Interface Name</b>   | SPE – NCD Interface (Logical)   |
| <b>Interface Number</b> | X_NP_FS-LB0100  |
| <b>Description</b>      | <p>This interface serves as the Internet connection between the FT and the NPOESS Certificate Directory. The FT retrieves the following NPOESS public Certificates:</p> <ul style="list-style-type: none"><li>• NPOESS Digital Signature Key Certificate</li><li>• NPOESS Key Agreement Key Certificate</li></ul> <p>This interface addresses the connections between the SPE-to-NCD.</p> |

#### 3.3.8.2.1 OPSCON Scenario

|               |                                       |
|---------------|---------------------------------------|
| <b>System</b> | SYS-020-070 Selective Data Encryption |
|---------------|---------------------------------------|

#### 3.3.8.2.2 Data Transaction and Response

|                 |                               |
|-----------------|-------------------------------|
| <b>Sender</b>   | NPOESS Certificate Directory  |
| <b>Receiver</b> | FT with internet connectivity |
| <b>Response</b> | N/A                           |

#### 3.3.8.2.3 Data Content, Data Format, and Data Mnemonic

|                                     |   |
|-------------------------------------|---|
| <b>Data Content and Data Format</b> | <p>NPOESS Digital Signature Certificate (X.509 Certificate Standard). The certificate is comprised of an encrypted digital signature and clear text message including the public key.</p> <p>NPOESS Key Agreement Certificate (X.509 Certificate Standard). The certificate is comprised of an encrypted digital signature and clear text message including the public key.</p> |
| <b>Data Mnemonic</b>                | N/A   |

#### 3.3.8.2.4 Protocol and Parameters

|                   |   |
|-------------------|---|
| <b>Protocol</b>   | <p>HTTPS: FT user initiates access to NCD Web site</p> <p>HTTPS: Valid Web address – <b>FTS-TBD-10555</b></p>   |
| <b>Parameters</b> | <p>The FT users retrieve the public key certificates from the NCD.</p> <p>NOTE: For autonomous mode operations without Internet connectivity, the FTS sponsor may need to retrieve initial NPOESS public keys and provide to the FTS users.</p> |

### 3.3.8.2.5 Data Volume and Data Rate

**Data Volume** N/A

**Data Rate** N/A

### 3.3.8.2.6 Interface Characteristics

**Frequency** N/A

**Timeouts** N/A

**Thresholds** N/A

### 3.3.8.2.7 Security

**Client Authentication Required** FTS-TBD-10556

**Encryption Required** Encrypted via SSL

### 3.3.8.2.8 Priority and Constraints

**Priority** There is no prioritization of data or users for this interface, except as handled by the transfer protocol.

**Constraints** Users have read-only privileges to access posted data.

### 3.3.8.2.9 Effectivity

**Interface Effectivity** State 2 – NPOESS Only

State 3 – NPOESS Only

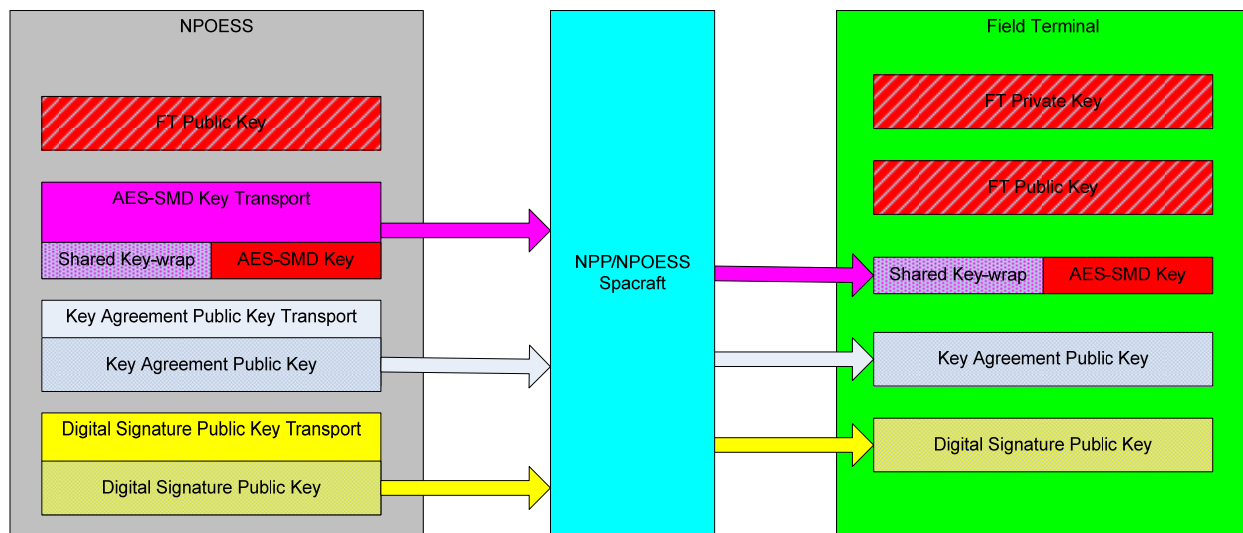
## 4.0 KEY TRANSPORTS

NPOESS mission data is encrypted at selected times. In order to facilitate approved Field Terminals access to this data, NPOESS uses a key transport mechanism to enable decryption of NPOESS downlink data.

### 4.1 Introduction

NPOESS can accommodate up to 500 possible Field Terminals who can generate their own public/private key pairs for use in decrypting NPOESS downlink data. Field Terminals must coordinate this access and generation of the keys with their respective Field Terminal Sponsoring Agency as well as comply with their sponsoring agencies Certificate Practice Statement (CPS).

Figure 4.1-1, Key Transport Graphical Depiction provides an overview of the key transport methodology.



**Figure 4.1-1, Key Transport Graphical Depiction**

For details on the implementation, see the Field Terminal Decryption Specification, SS23-0060.

## **4.1.1 Types of Key Transports**

### **4.1.1.1 NPOESS Key Agreement Public Key Transport**

The NPOESS Key Agreement Public Key is used for confidentially distributing the NPOESS Key Agreement Public Key (NKA). This transport includes the NPOESS Key Agreement Public key and is signed with a digital signature.

See the CDFCB-X, Vol VII, Part 1, NPOESS Downlink Data Formats, D34862-07-01, Section 5.7, Key Agreement Key Transport, for data format details.

### **4.1.1.2 NPOESS Digital Signature Public Key Transport**

The NPOESS Digital Signature Public Key Transport is used for source authentication in the distribution of the NPOESS Digital Signature Public Key (NDS). This transport includes the new NPOESS Digital Signature Public Key and is signed with the old digital signature key. See the CDFCB-X, Vol VII, Part 1, NPOESS Downlink Data Formats, D34862-07-01, Section 5.6, Digital Signature Key Transport, for Digital Signature Public Key Transport format details.

### **4.1.1.3 AES-SMD Key Transport**

The AES-SMD Key Transport is used to securely distribute an AES-SMD key to each authorized field terminals. The AES-SMD key is encrypted with an elliptical curve diffie hellman derived key, also called a shared key.

See the CDFCB-X, Vol VII, Part 1, NPOESS Downlink Data Formats, D34862-07-01, Section 5.5, AES2 Key Transports, for format details.

## **4.2 Field Terminal Key Events Flow**

### **4.2.1 FT Key Initialization**

In order for Field Terminals to receive and decrypt data during Selective Data Encryption (SDE) Mode, it is necessary to be initialized with the appropriate

public/private key pairs. The process to obtain the necessary keys is:

1. Field Terminal sends a request to the FT Sponsoring Agency Registration Authority (FT RA) to obtain a public key certificate. The X.509 Certificate, Version 3, request, including applicable NPOESS extensions, must be completed for each FT user.
2. FT RA generates a Public/Private Elliptical Curve key pair for the FT. Alternatively, FTs can also generate their own public/private key pair and send it to the FT RA.
3. FT RA confirms that the certificate request meets the requirements of the FT Sponsoring Agency CA's Certificate Practices Statement (CPS), creates and signs the certificate, and sends the X.509 FT Public Key Certificate to the FT RA's Certificate Directory.
4. FT RA sends X.509 FT Public Key certificate to the FT.
5. FT RA delivers the FT private key to the FT via appropriate methods.
6. Once the NPOESS Key Agreement and Digital Signature public keys are available, the FT pulls the NPOESS Key Agreement and Digital Signature public key X.509 certificates from the NCD directory or from the FT registration authority.

#### **4.2.2 Retrieval of AES2 Key**

In the steps below, the FT refers to the software included in the SPE. Any actions a FT user or operator need to follow would be up to the specific implementation of the field terminal SPE hardware and software.

1. FT receives the AES2 key transport application packet, consisting of up to 500 key transports and traverses the packet to find their unique user ID (S/Ns and user ID are in plain text, only AES key and AES signature are encrypted.)
2. FT identifies NPOESS Digital Signature and Key Agreement public keys based on S/Ns provided in the key transport message.
3. Using the Digital Signature public key (identified by the Digital Signature public key S/N), the FT decrypts the hash (signature) and compares it with a hash calculated across the key transport message to confirm integrity.
4. Using the Key Agreement Public key (identified by the Key Agreement S/N) the

message data from the application packet, and the FT private key, the FT inputs these keys along with the shared data in the transport to the ECDH algorithm to generate the symmetrical key and decrypts the AES key for the mission data using the generated key from ECDH.

5. FT uses the decrypted AES key to decrypt the mission data coming from the spacecraft in their SPE.

#### **4.2.3 Retrieval of the NPOESS Key Agreement (NKA) Key**

1. FT receives the NKA key transport application packet.
2. FT identifies NPOESS Digital Signature public key based on S/N provided in the key transport message.
3. Using the Digital Signature public key (identified by the Digital Signature public key S/N), the FT decrypts the hash (signature) and compares it with a hash calculated across the key transport message to confirm integrity.
4. FT extracts the new NKA public key from the application packet

#### **4.2.4 Retrieval of the NPOESS Digital Signature (NDS) Key**

1. FT receives the NDS key transport application packet.
2. FT identifies NPOESS Digital Signature public key based on S/N provided in the key transport message.
3. Using the Digital Signature public key (identified by the Digital Signature public key S/N), the FT decrypts the hash (signature) and compares it with a hash calculated across the key transport message to confirm integrity.
4. FT extracts the new NDS public key from the application packet.

### **4.3 X.509v3 Certificate Structure**

The X.509v3 Certificate Structure for NPOESS follows the X.509, version 3 certificate standard. For complete details, see the Field Terminal Decryption Specification, SS23-0060.

### **4.4 NPOESS Certificate Practice Statement (CPS) and Certificate Revocation List (CRL) Procedures**

The processes and guidelines for Field Terminals regarding Certificate Practice Statements (CPS) and Certificate Revocation List (CRL) procedures are controlled, organized, and negotiated between the Field Terminal and the Field Terminal Sponsoring Agencies. The terms of these agreements are established and coordinated with the NPOESS Program Office and the Field Terminal Sponsoring Agencies. Consult the FT Sponsoring Agency CA's CPS for details.

### **4.5 Elliptical Curve Parameters and Function**

The specific curve parameters, field and curve type, base points, function are defined in the Field Terminal Decryption Specification, SS23-0060.5.0

## 5.0 INTERFACE VERIFICATION

Table 5.0-1, Interface Verification Matrix, provides a reference for the Verification methodology for the logical interfaces defined in this ICD. This methodology is derived from the existing requirement for the respective interface. This matrix links the interface requirement identification number to the interface mnemonic and then indicates the Interface Verification methodology for the segment levels. Each interface verification cites one or more of the verification methods described in the NPOESS Glossary, D35836.



**Table 5.0-1, Interface Verification Matrix**

| Requirement ID | I/F Mnemonic   | Interface Title   | Verification Method |              |
|----------------|----------------|---|---------------------|--------------|
|                |                |   | Segment Level       | System Level |
| FTS005440      | T_FS_FD-LB3000 | SPE – DPE Interface (Logical)                               | Inspection          | Inspection   |
| FTS002700      | T_FS_FD-PB3000 | SPE – DPE Interface (Physical)                              | NA                  | NA           |
| FTS002220      | X_FD_FM-LB5100 | DPE – MAE Deliverable Data Product Request Status (Logical) | Inspection          | Inspection   |
| FTS002015      | X_FD_FM-LB5200 | DPE – MAE Deliverable Data Products (Logical)               | Inspection          | Inspection   |
| FTS002065      | X_FD_FM-LB5200 | DPE – MAE Deliverable Data Products (Logical)               | Inspection          | Inspection   |
| FTS002160      | X_FD_FM-LB5300 | DPE – MAE Data Delivery Report (Logical)                    | Inspection          | Inspection   |
| FTS002165      | X_FD_FM-LB5400 | DPE – MAE Deliverable Data Automated Notification (Logical) | Inspection          | Inspection   |
| FTS002155      | X_FM_FD-LB5000 | DPE – MAE Deliverable Data Product Request (Logical)        | Inspection          | Inspection   |
| FTS002150      | X_FM_FD-PB5000 | DPE – MAE Network Connection (Physical)                     | NA                  | NA           |
| FTS002205      | X_FO_FD-LB6000 | FT Operator – DPE (Logical)                                 | Inspection          | Inspection   |
| FTS003060      | X_FO_FD-PB6000 | FT Operator – DPE (Physical)                                | NA                  | NA           |
| FTS002108      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)                       | Inspection          | Inspection   |
| FTS004400      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)                       | Inspection          | Inspection   |
| FTS004500      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)                       | Inspection          | Inspection   |
| FTS004600      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)                       | NA                  | Inspection   |
| FTS004700      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)                       | NA                  | Inspection   |
| FTS004800      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)                       | NA                  | Inspection   |
| FTS004900      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)                       | Inspection          | Inspection   |
| FTS004905      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)                       | Inspection          | Inspection   |

| Requirement ID | I/F Mnemonic   | Interface Title                             | Verification Method |              |
|----------------|----------------|---|---------------------|--------------|
|                |                |   | Segment Level       | System Level |
| FTS004910      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)       | Inspection          | Inspection   |
| FTS004915      | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)       | Inspection          | Inspection   |
| FTS001830      | X_MS_FT-PB4000 | FT – MSD External Interface (Physical)      | NA                  | Inspection   |
| FTS002145      | X_MS_FT-PB4000 | FT – MSD External Interface (Physical)      | NA                  | Inspection   |
| FTS006010      | X_NP_FS-PB0100 | SPE – NCD Interface (Physical)              | NA                  | NA           |
| FTS006020      | X_NP_FS-LB0100 | SPE – NCD Interface (Logical)               | NA                  | NA           |
| FTS001780      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS001870      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002001      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002084      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002090      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002170      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002210      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002505      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002507      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002540      | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| SS301520       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS301540       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304310       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304320       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304330       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304340       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304350       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |

| Requirement ID | I/F Mnemonic   | Interface Title                             | Verification Method |              |
|----------------|----------------|---|---------------------|--------------|
|                |                |   | Segment Level       | System Level |
| SS305305       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS305306       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS305315       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| FTS001781      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002175      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002180      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002185      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002190      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002195      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002200      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002202      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002215      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| FTS002545      | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | NA                  | Inspection   |
| SS301470       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304370       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304380       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304390       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304400       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304410       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304415       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304420       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304430       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |
| SS304435       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | Test                | Inspection   |

| Requirement ID | I/F Mnemonic   | Interface Title                                 | Verification Method |              |
|----------------|----------------|---|---------------------|--------------|
|                |                |   | Segment Level       | System Level |
| FTS002135      | X_SS_FS-PH2100 | NPOESS – HRD to FTS SPE RF Interface (Physical) | NA                  | Inspection   |
| SS304300       | X_SS_FS-PH2100 | NPOESS – HRD to FTS SPE RF Interface (Physical) | Test                | Inspection   |
| FTS002140      | X_SS_FS-PL2100 | NPOESS – LRD to FTS SPE RF Interface (Physical) | NA                  | Inspection   |
| SS304360       | X_SS_FS-PL2100 | NPOESS – LRD to FTS SPE RF Interface (Physical) | Test                | Inspection   |
|                |                |   |                     |              |

\*Note: Verification applies to the NPOESS and DPE portions of the Field Terminal only (rather than to the entire SPE/DPE/MAE portions of the FT)

## 6.0 OPERATIONAL AGREEMENTS

There are no operational agreements associated with this ICD.

### APPENDIX A: SEGMENT INTERFACE REQUIREMENTS

This appendix provides a requirement traceability table extracted from the Standard Tool for Systems Engineering (SLATE) primarily to ensure the segments have captured the interface requirements within their requirements documents. This table lists all interfaces with their respective segment requirements.

**Table A-1, Segment Interface Requirements**

| Sender Segment Trace | Sender Segment Text   | I/F ID         | I/F Title   | Receiver Segment Trace | Receiver Segment Text |
|----------------------|---|----------------|---|------------------------|-----------------------|
| FTS005440            | The FTS shall be capable of transferring complete Application Packets from the SPE to the DPE, in accordance with interface T_FS_FD-LB3000 of the NPOESS-to-FT ICD, D34651.         | T_FS_FD-LB3000 | SPE – DPE Interface (Logical)                               | NA                     | NA                    |
| FTS002700            | The SPE shall be capable of physically interfacing with the DPE, in accordance with interface T_FS_FD-PB3000 in the NPOESS-to-FT ICD, D34651.                                       | T_FS_FD-PB3000 | SPE – DPE Interface (Physical)                              | NA                     | NA                    |
| FTS002220            | The FTS shall be capable of providing data product query and request status to FT Users, in accordance with interface X_FD_FM-LB5100 of the NPOESS-to-FT ICD, D34651.               | X_FD_FM-LB5100 | DPE – MAE Deliverable Data Product Request Status (Logical) | NA                     | NA                    |
| FTS002015            | The FTS shall be capable of making NPOESS Data Products and associated metadata available to FT Users, in accordance with interface X_FD_FM-LB5200 of the NPOESS-to-FT ICD, D34651. | X_FD_FM-LB5200 | DPE – MAE Deliverable Data Products (Logical)               | NA                     | NA                    |

| Sender Segment Trace | Sender Segment Text   | I/F ID         | I/F Title   | Receiver Segment Trace | Receiver Segment Text   |
|----------------------|---|----------------|---|------------------------|---|
| FTS002065            | The FTS shall be capable of making A-DCS data available to FT Users, in accordance with interface X_FD_FM-LB5200 of the NPOESS-to-FT ICD, D34651.                               | X_FD_FM-LB5200 | DPE – MAE Deliverable Data Products (Logical)               | NA                     | NA  |
| FTS002160            | The FTS shall be capable of making Data Delivery Reports available to FT Users, in accordance with interface X_FD_FM-LB5300 of the NPOESS-to-FT ICD, D34651.                    | X_FD_FM-LB5300 | DPE – MAE Data Delivery Report (Logical)                    | NA                     | NA  |
| FTS002165            | The FTS shall be capable of making Deliverable Data Automated Notifications available to FT Users, in accordance with interface X_FD_FM-LB5400 of the NPOESS-to-FT ICD, D34651. | X_FD_FM-LB5400 | DPE – MAE Deliverable Data Automated Notification (Logical) | NA                     | NA  |
| NA                   | NA  | X_FM_FD-LB5000 | DPE – MAE Deliverable Data Product Request (Logical)        | FTS002155              | The FTS shall be capable of receiving data product queries and requests from FT Users, in accordance with interface X_FM_FD-LB5000 of the NPOESS-to-FT ICD, D34651. |
| FTS002150            | The MAE shall be capable of physically interfacing with the DPE, in accordance with interface X_FM_FD-PB5000 of the NPOESS-to-FT ICD, D34651.                                   | X_FM_FD-PB5000 | DPE – MAE Network Connection (Physical)                     | NA                     | NA  |
| FTS002205            | The FTS shall be capable of interfacing with the Field Terminal Operator, in accordance with interface X_FO_FD-LB6000 in the NPOESS-to-FT ICD, D34651.                          | X_FO_FD-LB6000 | FT Operator – DPE (Logical)                                 | NA                     | NA  |
| FTS003060            | The FTS shall be capable of physically interfacing with the Field Terminal Operator, in accordance with interface X_FO_FD-PB6000 in the NPOESS-to-FT ICD, D34651.               | X_FO_FD-PB6000 | FT Operator – DPE (Physical)                                | NA                     | NA  |

| Sender Segment Trace | Sender Segment Text | I/F ID         | I/F Title                             | Receiver Segment Trace | Receiver Segment Text  |
|----------------------|---------------------|----------------|---------------------------------------|------------------------|--|
| NA                   | NA                  | X_MS_FT-LB4000 | FT – MSD External Interface (Logical) | FTS002108              | The FTS shall be capable of retrieving ODAD from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651.  |
| NA                   | NA                  | X_MS_FT-LB4000 | FT – MSD External Interface (Logical) | FTS004400              | The FTS shall be capable of retrieving Mission Schedules from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651.                                 |
| NA                   | NA                  | X_MS_FT-LB4000 | FT – MSD External Interface (Logical) | FTS004500              | The FTS shall be capable of retrieving satellite Two Line Element (TLE) Sets from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651.             |
| NA                   | NA                  | X_MS_FT-LB4000 | FT – MSD External Interface (Logical) | FTS004600              | The FTS shall be capable of retrieving Mission Notices from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651.                                   |
| NA                   | NA                  | X_MS_FT-LB4000 | FT – MSD External Interface (Logical) | FTS004700              | The FTS shall be capable of retrieving E-MSDS Data Lists from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651.                                 |
| NA                   | NA                  | X_MS_FT-LB4000 | FT – MSD External Interface (Logical) | FTS004800              | The FTS shall be capable of retrieving HRD/LRD Monitoring Reports from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651.                        |
| NA                   | NA                  | X_MS_FT-LB4000 | FT – MSD External Interface (Logical) | FTS004900              | The FTS shall be capable of retrieving Processing Coefficient Tables from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651.                     |
| NA                   | NA                  | X_MS_FT-LB4000 | FT – MSD External Interface (Logical) | FTS004905              | The FTS shall be capable of retrieving Prediction of Post Maneuver Two Line Element Sets from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651. |



| Sender Segment Trace | Sender Segment Text  | I/F ID         | I/F Title                                   | Receiver Segment Trace | Receiver Segment Text  |
|----------------------|--|----------------|---|------------------------|--|
| NA                   | NA   | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)       | FTS004910              | The FTS shall be capable of retrieving Spacecraft Configuration Database Updates from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651.   |
| NA                   | NA   | X_MS_FT-LB4000 | FT – MSD External Interface (Logical)       | FTS004915              | The FTS shall be capable of retrieving VIIRS Calibration F-Tables from the E-MSDS, in accordance with interface X_MS_FT-LB4000 of the NPOESS-to-FT ICD, D34651.  |
| NA                   | NA   | X_MS_FT-PB4000 | FT – MSD External Interface (Physical)      | FTS001830              | The FTS shall be capable of retrieving ancillary data from user-specified external sources, in accordance with interface X_MS_FT-PB4000 of the NPOESS-to-FT ICD, D34651.   |
| NA                   | NA   | X_MS_FT-PB4000 | FT – MSD External Interface (Physical)      | FTS002145              | The FTS shall be capable of physically interfacing with the E-MSDS, in accordance with interface X_MS_FT-PB4000 of the NPOESS-to-FT ICD, D34651.   |
| NA                   | NA   | X_NP_FS-PB0100 | SPE – NCD Interface (Physical)              | FTS006010              | The FTS shall be capable of retrieving NPOESS Public Key Certificates from the NPOESS Certificate Directory (NCD), in accordance with interface X_NP_FS-PB0100 of the NPOESS-to-FT ICD, D34651.                                      |
| NA                   | NA   | X_NP_FS-LB0100 | SPE – NCD Interface (Logical)               | FTS006020              | The FTS shall be capable of retrieving NPOESS Public Key Certificates from the NPOESS Certificate Directory (NCD), in accordance with interface X_NP_FS-LB0100 of the NPOESS-to-FT ICD, D34651.                                      |
| SS304340             | The satellite shall be capable of transmitting Geographically Constrained Dynamic Ancillary Data in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651. | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS001780              | The FTS shall be capable of receiving Geographically Constrained Official Dynamic Ancillary Data (ODAD) from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651. |

| Sender Segment Trace | Sender Segment Text   | I/F ID         | I/F Title                                   | Receiver Segment Trace | Receiver Segment Text   |
|----------------------|---|----------------|---|------------------------|---|
| SS304310             | The satellite shall be capable of transmitting a Direct Mode Data Message (DMDM) in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.                | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS001870              | The FTS shall be capable of receiving Direct Mode Data Messages (DMDM) from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.                 |
| SS304350             | The satellite shall be capable of transmitting Globally Relevant MSD in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.                            | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS002001              | The FTS shall be capable of receiving Globally Relevant MSD from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.                            |
| SS301540             | The satellite shall be capable of transmitting A-DCS data in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS to FT ICD, D34651.                                       | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS002084              | The FTS shall be capable of receiving A-DCS data from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.                                       |
| SS301520             | The satellite shall be capable of transmitting satellite Two Line Element Sets in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.                  | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS002090              | The FTS shall be capable of receiving satellite Two Line Element (TLE) Sets from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.            |
| SS304320             | The satellite shall be capable of transmitting satellite ephemeris and attitude data in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.            | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS002170              | The FTS shall be capable of receiving satellite ephemeris and attitude data from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.            |
| SS304330             | The satellite shall be capable of transmitting sensor science, calibration and engineering data in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651. | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS002210              | The FTS shall be capable of receiving sensor science, calibration and engineering data from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651. |

| Sender Segment Trace | Sender Segment Text  | I/F ID         | I/F Title                                   | Receiver Segment Trace | Receiver Segment Text  |
|----------------------|--|----------------|---|------------------------|--|
| SS305305             | The satellite shall be capable of transmitting the NPOESS Key Agreement Public Keys in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.              | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS002505              | The FTS shall be capable of receiving Key Agreement Public Keys from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.   |
| SS305306             | The satellite shall be capable of transmitting the NPOESS Digital Signature Public Keys in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.          | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS002507              | The FTS shall be capable of receiving the Spacecraft Digital Signature Public Keys from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.                          |
| SS305315             | The satellite shall be capable of transmitting the AES2 Key Transports in the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.                           | X_SS_FS-LH2100 | NPOESS – HRD to FTS SPE Interface (Logical) | FTS002540              | The FTS shall be capable of receiving AES2 Key Transports from the NPOESS satellite via the HRD downlink, in accordance with interface X_SS_FS-LH2100 of the NPOESS-to-FT ICD, D34651.   |
| SS304390             | The satellite shall be capable of transmitting satellite Two Line Element Sets in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.                   | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | FTS001781              | The FTS shall be capable of receiving satellite Two Line Element (TLE) Sets from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.                                 |
| SS304400             | The satellite shall be capable of transmitting Geographically Constrained Dynamic Ancillary Data in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651. | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | FTS002175              | The FTS shall be capable of receiving the Geographically Constrained Official Dynamic Ancillary Data (ODAD) from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651. |
| SS304370             | The satellite shall be capable of transmitting satellite ephemeris and attitude data in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.             | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | FTS002180              | The FTS shall be capable of receiving satellite ephemeris and attitude data from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.                                 |

| Sender Segment Trace | Sender Segment Text   | I/F ID         | I/F Title                                   | Receiver Segment Trace | Receiver Segment Text   |
|----------------------|---|----------------|---|------------------------|---|
| SS304420             | The satellite shall be capable of transmitting A-DCS data in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS to FT ICD, D34651.                                       | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | FTS002185              | The FTS shall be capable of receiving A-DCS data from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.                                       |
| SS304410             | The satellite shall be capable of transmitting Globally Relevant MSD in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.                            | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | FTS002190              | The FTS shall be capable of receiving Globally Relevant MSD from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.                            |
| SS301470             | The satellite shall be capable of transmitting a Direct Mode Data Message (DMDM) in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.                | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | FTS002195              | The FTS shall be capable of receiving Direct Mode Data Messages (DMDM) from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.                 |
| SS304430             | The satellite shall be capable of transmitting the NPOESS Key Agreement Public Keys in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.             | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | FTS002200              | The FTS shall be capable of receiving Key Agreement Public Keys from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.                        |
| SS304435             | The satellite shall be capable of transmitting the NPOESS Digital Signature Public Keys in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.         | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | FTS002202              | The FTS shall be capable of receiving the Spacecraft Digital Signature Public Keys from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651.     |
| SS304380             | The satellite shall be capable of transmitting sensor science, calibration and engineering data in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651. | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical) | FTS002215              | The FTS shall be capable of receiving sensor science, calibration and engineering data from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651. |

| Sender Segment Trace | Sender Segment Text  | I/F ID         | I/F Title                                       | Receiver Segment Trace | Receiver Segment Text  |
|----------------------|--|----------------|---|------------------------|--|
| SS304415             | The satellite shall be capable of transmitting the AES2 Key Transports in the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651. | X_SS_FS-LL2100 | NPOESS – LRD to FTS SPE Interface (Logical)     | FTS002545              | The FTS shall be capable of receiving AES2 Key Transports from the NPOESS satellite via the LRD downlink, in accordance with interface X_SS_FS-LL2100 of the NPOESS-to-FT ICD, D34651. |
| SS304300             | The NPOESS Satellite shall provide an HRD downlink, in accordance with interface X_SS_FS-PH2100 of the NPOESS-to-FT ICD, D34651.   | X_SS_FS-PH2100 | NPOESS – HRD to FTS SPE RF Interface (Physical) | FTS002135              | The FTS shall be capable of receiving an HRD signal from the NPOESS satellite, in accordance with interface X_SS_FS-PH2100 of the NPOESS-to-FT ICD, D34651.                            |
| SS304360             | The NPOESS Satellite shall provide an LRD downlink, in accordance with interface X_SS_FS-PL2100 of the NPOESS-to-FT ICD, D34651.   | X_SS_FS-PL2100 | NPOESS – LRD to FTS SPE RF Interface (Physical) | FTS002140              | The FTS shall be capable of receiving an LRD signal from the NPOESS satellite, in accordance with interface X_SS_FS-PL2100 of the NPOESS-to-FT ICD, D34651.                            |

## APPENDIX B: LOGICAL INTERFACE MAPPING MATRIX

This appendix maps the physical interface(s) to the logical interface. It is possible to have one logical interface to multiple physical interfaces.

**Table B-1, Interface Mnemonic Mapping Matrix**

| Interface    | Physical Interface Mnemonic | Associated Logical Interface Mnemonic(s) |
|--------------|-----------------------------|--|
| NPP – SPE    | X_PS_FS-PH2000              | X_PS_FS-LH2000                           |
| NPOESS – SPE | X_SS_FS-PH2100              | X_SS_FS-LH2100                           |
| NPOESS – SPE | X_SS_FS-PL2100              | X_SS_FS-LL2100                           |
| SPE – DPE    | T_FS_FD-PB3000              | T_FS_FD-LB3000                           |
| FT – MSDS    | X_MS_FT-PB4000              | X_MS_FT-LB4000                           |
| DPE – MAE    | X_FM_FD-PB5000              | X_FM_FD-LB5000                           |
| DPE – MAE    | X_FM_FD-PB5000              | X_FD_FM-LB5100                           |
| DPE – MAE    | X_FM_FD-PB5000              | X_FD_FM-LB5200                           |
| DPE – MAE    | X_FM_FD-PB5000              | X_FD_FM-LB5300                           |
| DPE – MAE    | X_FM_FD-PB5000              | X_FD_FM-LB5400                           |
| FTO – DPE    | X_FO_FD-PB6000              | X_FO_FD-LB6000                           |
| SPE – NCD    | X_NP_FS-PB0100              | X_NP_FS-LB0100                           |

### APPENDIX C: FTS ICD UNIQUE ACRONYM LIST

This table identifies and defines the acronyms that are unique to this ICD. All other acronyms are listed and identified in the NPOESS Acronyms, D35838.

**Table C-1, FTS ICD Unique Acronym List**

| Acronym | Definition |
|---------|------------|
|         |            |

**APPENDIX D: RESERVED**



## APPENDIX E: LOGICAL INTERFACE TO DATA MNEMONICS MAPPING

This table identifies all the data mnemonics corresponding to the data a field terminal is capable of receiving in the HRD and LRD downlinks. The APID allocations, data content, and data format associated with these data mnemonics are documented in the NPOESS CDFCB-X (D34862 Volumes VI and VII). For the NPP SPE, the APID formats are documented in the NPP MDFCB, GSFC-429-05-02-42.

**Table E-1, Logical Interface to Data Mnemonic Mapping**

| Data Document                                  | Data Mnemonic    | Data Description  | Interface Mnemonic |
|--|------------------|---|--------------------|
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DC_NU-L00000-001 | A-DCS - Science - SMD   | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-003 | ATMS - Calibration  | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-010 | ATMS - Engineering - Health and Status                          | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-009 | ATMS - Engineering - Hot Calibration Temperatures               | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-008 | ATMS - Operational Mode   | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-000 | Application Packet  | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-003 | CrIS - Engineering Telemetry                                    | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-001 | CrIS - Science - Earth, Deep Space & Internal Calibration Scene | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-004 | CrIS - LRD - LW/MW Earth Scene                                  | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-002 | CrIS - Science Telemetry  | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-007 | MSD - Key Agreement Key Transport                               | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-006 | MSD - Digital Signature Key Transport                           | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-005 | MSD - AES2 Key Transports                                       | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-001 | MSD - Ancillary Data - Geographic Distribution                  | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-002 | MSD - Auxiliary Data - Global Distribution                      | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-003 | MSD - Auxiliary Data - Two Line Element Sets                    | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-004 | MSD - Direct Mode Data Message                                  | T_FS_FD-LB3000     |

| Data Document                                  | Data Mnemonic    | Data Description                             | Interface Mnemonic |
|--|------------------|--|--------------------|
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | OM_NU-L00000-010 | OMPS - Calibration - NPC                     | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | OM_NU-L00000-009 | OMPS - Calibration - NTCC                    | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | OM_NU-L00000-005 | OMPS - Nadir Total Column Earth View         | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | OM_NU-L00000-006 | OMPS - Science - NPR                         | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_NU-L00000-002 | Spacecraft DSU Auxiliary Data                | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_NU-L00000-001 | Spacecraft SCP Auxiliary Data                | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-003 | VIIRS - HRD - Engineering                    | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-001 | VIIRS - HRD - Science                        | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-002 | VIIRS - HRD - Calibration                    | T_FS_FD-LB3000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-004 | VIIRS - LRD - Science                        | T_FS_FD-LB3000     |
| D34862-02: NPOESS CDFCB-X Volume II            | RDRE-ADCS-C0030  | A-DCS Mission (Science) RDR                  | X_FD_FM-LB5200     |
| D34862-02: NPOESS CDFCB-X Volume II            | RDRE-ATMS-C0030  | ATMS Science RDR                             | X_FD_FM-LB5200     |
| D34862-02: NPOESS CDFCB-X Volume II            | RDRE-CRIS-C0030  | CrIS Science RDR                             | X_FD_FM-LB5200     |
| D34862-02: NPOESS CDFCB-X Volume II            | RDRE-OMPS-C0030  | OMPS Nadir Profile Science RDR               | X_FD_FM-LB5200     |
| D34862-02: NPOESS CDFCB-X Volume II            | RDRE-OMPS-C0031  | OMPS Nadir Total Column Science RDR          | X_FD_FM-LB5200     |
| D34862-02: NPOESS CDFCB-X Volume II            | RDRE-VIRS-C0030  | VIIRS Science RDR                            | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III           | SDRE-ATMR-C0030  | ATMS Remapped to CrIS SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III           | SDRE-ATMS-C0030  | ATMS Science SDR                             | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III           | TDRE-ATMS-C0030  | ATMS Science TDR                             | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III           | SDRE-CRIS-C0030  | CrIS Science SDR: LWIR, MWIR, and SWIR bands | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III           | SDRE-OMPS-C0031  | OMPS Nadir Profile Calibration SDR           | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III           | SDRE-OMPS-C0030  | OMPS Nadir Profile Science SDR               | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III           | SDRE-OMTC-C0031  | OMPS Nadir Total Column Calibration SDR      | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III           | SDRE-OMTC-C0030  | OMPS Nadir Total Column Science SDR          | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III           | SDRE-VDNB-C0030  | VIIRS Day Night Band SDR                     | X_FD_FM-LB5200     |

| Data Document                                 | Data Mnemonic   | Data Description   | Interface Mnemonic |
|---|-----------------|--|--------------------|
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VI01-C0030 | VIIRS Imagery Band 01 SDR                                | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VI02-C0030 | VIIRS Imagery Band 02 SDR                                | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VI03-C0030 | VIIRS Imagery Band 03 SDR                                | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VI04-C0030 | VIIRS Imagery Band 04 SDR                                | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VI05-C0030 | VIIRS Imagery Band 05 SDR                                | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM01-C0030 | VIIRS Moderate Resolution Band 01 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM02-C0030 | VIIRS Moderate Resolution Band 02 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM03-C0030 | VIIRS Moderate Resolution Band 03 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM04-C0030 | VIIRS Moderate Resolution Band 04 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM05-C0030 | VIIRS Moderate Resolution Band 05 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM06-C0030 | VIIRS Moderate Resolution Band 06 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM07-C0030 | VIIRS Moderate Resolution Band 07 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM08-C0030 | VIIRS Moderate Resolution Band 08 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM09-C0030 | VIIRS Moderate Resolution Band 09 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM10-C0030 | VIIRS Moderate Resolution Band 10 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM11-C0030 | VIIRS Moderate Resolution Band 11 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM12-C0030 | VIIRS Moderate Resolution Band 12 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM13-C0030 | VIIRS Moderate Resolution Band 13 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM14-C0030 | VIIRS Moderate Resolution Band 14 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM15-C0030 | VIIRS Moderate Resolution Band 15 SDR                    | X_FD_FM-LB5200     |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM16-C0030 | VIIRS Moderate Resolution Band 16 SDR                    | X_FD_FM-LB5200     |
| D34862-04-01: NPOESS CDFCB-X Volume IV Part 1 | IMPE-NAOP-C0030 | OMPS Nadir Profile Ozone IP - Official                   | X_FD_FM-LB5200     |
| D34862-04-01: NPOESS CDFCB-X Volume IV Part 1 | ARPE-VRAF-C0030 | VIIRS Active Fires ARP - Official                        | X_FD_FM-LB5200     |
| D34862-04-01: NPOESS CDFCB-X Volume IV Part 1 | IMPE-CMIP-C0030 | VIIRS Cloud Mask IP - Official                           | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-AVMP-C1030 | CrIMSS Atmospheric Vertical Profile (AVP) EDR - Official | X_FD_FM-LB5200     |

| Data Document                                 | Data Mnemonic   | Data Description   | Interface Mnemonic |
|---|-----------------|--|--------------------|
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-OMTC-C0030 | OMPS Total Column Ozone EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-AOTH-C1030 | VIIRS AOT and APSP (Aerosols) EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-CLBH-C1030 | VIIRS Cloud Base Height EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-VCCL-C0030 | VIIRS Cloud Cover/Layers EDR - Official  | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-VCEP-C0030 | VIIRS Cloud Effective Particle Size EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-VCOT-C0030 | VIIRS Cloud Optical Thickness EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-VCTH-C0030 | VIIRS Cloud Top Height EDR - Official  | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-VCPT-C0030 | VIIRS Cloud Top Pressure EDR - Official  | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-VCCT-C0030 | VIIRS Cloud Top Temperature EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-IMAG-C0030 | VIIRS I-Band Imagery EDR - Official<br>VIIRS Imagery Band 01 EDR<br>VIIRS Imagery Band 02 EDR<br>VIIRS Imagery Band 03 EDR<br>VIIRS Imagery Band 04 EDR<br>VIIRS Imagery Band 05 EDR   | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-VMOD-C0030 | VIIRS Moderate Band Imagery EDR - Official<br>VIIRS 1st M Band Imagery EDR<br>VIIRS 2nd M Band Imagery EDR<br>VIIRS 3rd M Band Imagery EDR<br>VIIRS 4th M Band Imagery EDR<br>VIIRS 5th M Band Imagery EDR<br>VIIRS 6th M Band Imagery EDR | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-IMAG-C1030 | VIIRS Near Constant Contrast Imagery EDR - Official  | X_FD_FM-LB5200     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-VRSM-C0030 | VIIRS Suspended Matter EDR - Official  | X_FD_FM-LB5200     |
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-ICST-C1030 | VIIRS Ice Surface Temperature EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-VLST-C0030 | VIIRS Land Surface Temperature EDR - Official  | X_FD_FM-LB5200     |
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-VNHF-C0030 | VIIRS Net Heat Flux EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-VROC-C0030 | VIIRS Ocean Color/Chlorophyll EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-SICH-C1030 | VIIRS Sea Ice Characterization EDR - Official  | X_FD_FM-LB5200     |
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-SSTE-C1030 | VIIRS Sea Surface Temperature EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-SNCD-C1035 | VIIRS Snow Cover/Depth Binary Map EDR - Official   | X_FD_FM-LB5200     |
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-SNCD-C1030 | VIIRS Snow Cover/Depth Snow Fraction EDR - Official  | X_FD_FM-LB5200     |

| Data Document                                 | Data Mnemonic    | Data Description  | Interface Mnemonic |
|---|------------------|---|--------------------|
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-VSTV-C0030  | VIIRS Surface Type EDR - Official                             | X_FD_FM-LB5200     |
| D34862-04-03: NPOESS CDFCB-X Volume IV Part 3 | EDRE-VRVI-C0030  | VIIRS Vegetation Index EDR - Official                         | X_FD_FM-LB5200     |
| D34862-04-04: NPOESS CDFCB-X Volume IV Part 4 | EDRE-VRSA-C0030  | VIIRS Surface Albedo EDR - Official                           | X_FD_FM-LB5200     |
| D34862-06: NPOESS CDFCB-X Volume VI           | DP_NU-L00025-000 | DDS Delivery Checksum   | X_FD_FM-LB5200     |
| D34862-06: NPOESS CDFCB-X Volume VI           | DP_NU-L00050-000 | Data Delivery Report  | X_FD_FM-LB5300     |
| D34862-06: NPOESS CDFCB-X Volume VI           | DP_NU-L00060-000 | Deliverable Data Automated Notifications                      | X_FD_FM-LB5400     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10330-003 | Earth Orientation - Finals 2000A                              | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | DP_NU-LM2040-000 | External Mission Support Data Server Data List                | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | C3_NU-LW2080-000 | High Data Rate/Low Data Rate Monitoring Report                | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | C3_NU-LW2060-000 | Mission Notices   | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | C3_NU-L00070-070 | Mission Schedule  | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10015-120 | NAAPS File - 12 hour forecast                                 | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10015-150 | NAAPS File - 15 hour forecast                                 | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10015-180 | NAAPS File - 18 hour forecast                                 | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10015-210 | NAAPS File - 21 hour forecast                                 | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10015-240 | NAAPS File - 24 hour forecast                                 | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10015-060 | NAAPS File - 06 hour forecast                                 | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10015-090 | NAAPS File - 09 hour forecast                                 | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10015-030 | NAAPS File - 03 hour forecast                                 | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10000-150 | NCEP GFS Numerical Weather Prediction File - 15 hour forecast | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10000-180 | NCEP GFS Numerical Weather Prediction File - 18 hour forecast | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10000-210 | NCEP GFS Numerical Weather Prediction File - 21 hour forecast | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10000-240 | NCEP GFS Numerical Weather Prediction File - 24 hour forecast | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10000-120 | NCEP GFS Numerical Weather Prediction File - 12 hour forecast | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI           | AN_NP-L10000-030 | NCEP GFS Numerical Weather Prediction File - 03 hour forecast | X_MS_FT-LB4000     |

| Data Document                                  | Data Mnemonic    | Data Description  | Interface Mnemonic |
|--|------------------|---|--------------------|
| D34862-06: NPOESS CDFCB-X Volume VI            | AN_NP-L10000-060 | NCEP GFS Numerical Weather Prediction File - 06 hour forecast   | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI            | AN_NP-L10000-090 | NCEP GFS Numerical Weather Prediction File - 09 hour forecast   | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI            | C3_NU-L00100-101 | Prediction of Post Maneuver Two Line Element Sets               | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI            | DP_NU-LM2020-001 | Processing Coefficients Table (Ephemeral PCs)                   | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI            | C3_NU-L00030-030 | Revolution Number   | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI            | C3_NU-L00040-040 | Spacecraft Configuration Database Update                        | X_MS_FT-LB4000     |
| D34862-06: NPOESS CDFCB-X Volume VI            | C3_NU-L00100-100 | Two Line Element Sets   | X_MS_FT-LB4000     |
| D34862-08: NPOESS CDFCB-X Volume VIII          | NP_NU-LM0233-031 | VIIRS F Table Processing Coefficients                           | X_MS_FT-LB4000     |
| D34862-08: NPOESS CDFCB-X Volume VIII          | NP_NU-LM0233-055 | VIIRS Solar Diffuser Processing Coefficients                    | X_MS_FT-LB4000     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-020 | Coded Virtual Channel Data Unit                                 | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DC_NU-L00000-001 | A-DCS - Science - SMD   | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-003 | ATMS - Calibration  | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-004 | ATMS - Diagnostic   | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-010 | ATMS - Engineering - Health and Status                          | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-009 | ATMS - Engineering - Hot Calibration Temperatures               | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-008 | ATMS - Operational Mode   | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-000 | Application Packet  | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-030 | Channel Access Data Unit  | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-003 | CrIS - Engineering Telemetry                                    | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-001 | CrIS - Science - Earth, Deep Space & Internal Calibration Scene | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-004 | CrIS - LRD - LW/MW Earth Scene                                  | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-002 | CrIS - Science Telemetry  | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-031 | Fill CADU   | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-007 | MSD - Key Agreement Key Transport                               | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-006 | MSD - Digital Signature Key Transport                           | X_SS_FS-LH2100     |

| Data Document                                  | Data Mnemonic    | Data Description                                  | Interface Mnemonic |
|--|------------------|---|--------------------|
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-005 | MSD - AES2 Key Transports                         | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-001 | MSD - Ancillary Data - Geographic Distribution    | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-002 | MSD - Auxiliary Data - Global Distribution        | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-003 | MSD - Auxiliary Data - Two Line Element Sets      | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-004 | MSD - Direct Mode Data Message                    | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-010 | Multiplexing Protocol Data Unit                   | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | OM_NU-L00000-010 | OMPS - Calibration - NPC                          | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | OM_NU-L00000-009 | OMPS - Calibration - NTCC                         | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | OM_NU-L00000-005 | OMPS - Nadir Total Column Earth View              | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | OM_NU-L00000-006 | OMPS - Science - NPR                              | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_NU-L00000-002 | Spacecraft DSU Auxiliary Data                     | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_NU-L00000-001 | Spacecraft SCP Auxiliary Data                     | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-003 | VIIRS - HRD - Engineering                         | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-001 | VIIRS - HRD - Science                             | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-002 | VIIRS - HRD - Calibration                         | X_SS_FS-LH2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-020 | Coded Virtual Channel Data Unit                   | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DC_NU-L00000-001 | A-DCS - Science - SMD                             | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-003 | ATMS - Calibration                                | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-004 | ATMS - Diagnostic                                 | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-010 | ATMS - Engineering - Health and Status            | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-009 | ATMS - Engineering - Hot Calibration Temperatures | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | AT_NU-L00000-008 | ATMS - Operational Mode                           | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-000 | Application Packet                                | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-030 | Channel Access Data Unit                          | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-003 | CrIS - Engineering Telemetry                      | X_SS_FS-LL2100     |

| Data Document                                  | Data Mnemonic    | Data Description  | Interface Mnemonic |
|--|------------------|---|--------------------|
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-001 | CrIS - Science - Earth, Deep Space & Internal Calibration Scene | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-004 | CrIS - LRD - LW/MW Earth Scene                                  | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | CR_NU-L00000-002 | CrIS - Science Telemetry  | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-031 | Fill CADU   | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-007 | MSD - Key Agreement Key Transport                               | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-006 | MSD - Digital Signature Key Transport                           | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-005 | MSD - AES2 Key Transports                                       | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-001 | MSD - Ancillary Data - Geographic Distribution                  | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-002 | MSD - Auxiliary Data - Global Distribution                      | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-003 | MSD - Auxiliary Data - Two Line Element Sets                    | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | DP_NU-L00000-004 | MSD - Direct Mode Data Message                                  | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_C3-L22000-010 | Multiplexing Protocol Data Unit                                 | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_NU-L00000-002 | Spacecraft DSU Auxiliary Data                                   | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | SS_NU-L00000-001 | Spacecraft SCP Auxiliary Data                                   | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-003 | VIIRS - HRD - Engineering                                       | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-002 | VIIRS - HRD - Calibration                                       | X_SS_FS-LL2100     |
| D34862-07-01: NPOESS CDFCB-X Volume VII Part 1 | VI_NU-L00000-004 | VIIRS - LRD - Science   | X_SS_FS-LL2100     |
| D34862-06: NPOESS CDFCB-X Volume VI            | C3_DP-L20010-001 | Application Packet Files  | T_FS_FD-LB3000     |



## APPENDIX F: HRD/LRD DATA PRODUCT MAPPING

This table provides the mapping of the output NPP/NPOESS Data Products to the HRD/LRD downlink including.

**Table F-1, HRD/LRD Data Product Mapping**

| Data Document                        | Data Mnemonic   | Data Description                             | Data Type | HRD | LRD |
|--------------------------------------|-----------------|--|-----------|-----|-----|
| D34862-02: NPOESS CDFCB-X Volume II  | RDRE-ADCS-C0030 | A-DCS Mission (Science) RDR                  | HDF5      | X   | X   |
| D34862-02: NPOESS CDFCB-X Volume II  | RDRE-ATMS-C0030 | ATMS Science RDR                             | HDF5      | X   | X   |
| D34862-02: NPOESS CDFCB-X Volume II  | RDRE-CRIS-C0030 | CrIS Science RDR                             | HDF5      | X   | X   |
| D34862-02: NPOESS CDFCB-X Volume II  | RDRE-OMPS-C0030 | OMPS Nadir Profile Science RDR               | HDF5      | X   |     |
| D34862-02: NPOESS CDFCB-X Volume II  | RDRE-OMPS-C0031 | OMPS Nadir Total Column Science RDR          | HDF5      | X   |     |
| D34862-02: NPOESS CDFCB-X Volume II  | RDRE-VIRS-C0030 | VIIRS Science RDR                            | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-ATMR-C0030 | ATMS Remapped to CrIS SDR                    | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-ATMS-C0030 | ATMS Science SDR                             | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-CRIS-C0030 | CrIS Science SDR: LWIR, MWIR, and SWIR bands | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-OMPS-C0030 | OMPS Nadir Profile Science SDR               | HDF5      | X   |     |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-OMPS-C0031 | OMPS Nadir Profile Calibration SDR           | HDF5      | X   |     |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-OMTC-C0030 | OMPS Nadir Total Column Science SDR          | HDF5      | X   |     |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-OMTC-C0031 | OMPS Nadir Total Column Calibration SDR      | HDF5      | X   |     |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-VDNB-C0030 | VIIRS Day Night Band SDR                     | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-VI01-C0030 | VIIRS Imagery Band 01 SDR                    | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-VI02-C0030 | VIIRS Imagery Band 02 SDR                    | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-VI03-C0030 | VIIRS Imagery Band 03 SDR                    | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-VI04-C0030 | VIIRS Imagery Band 04 SDR                    | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-VI05-C0030 | VIIRS Imagery Band 05 SDR                    | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III | SDRE-VM01-C0030 | VIIRS Moderate Resolution Band 01 SDR        | HDF5      | X   | X   |

| Data Document                                 | Data Mnemonic   | Data Description   | Data Type | HRD | LRD |
|---|-----------------|--|-----------|-----|-----|
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM02-C0030 | VIIRS Moderate Resolution Band 02 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM03-C0030 | VIIRS Moderate Resolution Band 03 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM04-C0030 | VIIRS Moderate Resolution Band 04 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM05-C0030 | VIIRS Moderate Resolution Band 05 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM06-C0030 | VIIRS Moderate Resolution Band 06 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM07-C0030 | VIIRS Moderate Resolution Band 07 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM08-C0030 | VIIRS Moderate Resolution Band 08 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM09-C0030 | VIIRS Moderate Resolution Band 09 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM10-C0030 | VIIRS Moderate Resolution Band 10 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM11-C0030 | VIIRS Moderate Resolution Band 11 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM12-C0030 | VIIRS Moderate Resolution Band 12 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM13-C0030 | VIIRS Moderate Resolution Band 13 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM14-C0030 | VIIRS Moderate Resolution Band 14 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM15-C0030 | VIIRS Moderate Resolution Band 15 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | SDRE-VM16-C0030 | VIIRS Moderate Resolution Band 16 SDR  | HDF5      | X   | X   |
| D34862-03: NPOESS CDFCB-X Volume III          | TDRE-ATMS-C0030 | ATMS Science TDR   | HDF5      | X   | X   |
| D34862-04-01: NPOESS CDFCB-X Volume IV Part 1 | ARPE-VRAF-C0030 | VIIRS Active Fires ARP - Official  | HDF5      | X   | X   |
| D34862-04-01: NPOESS CDFCB-X Volume IV Part 1 | IMPE-CMIP-C0030 | VIIRS Cloud Mask IP - Official   | HDF5      | X   | X   |
| D34862-04-01: NPOESS CDFCB-X Volume IV Part 1 | IMPE-NAOP-C0030 | OMPS Nadir Profile Ozone IP - Official   | HDF5      | X   |     |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-AOTH-C1030 | VIIRS AOT and APSP (Aerosols) EDR - Official   | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-AVMP-C1030 | CrIMSS Atmospheric Vertical Profile (AVP) EDR - Official   | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-CLBH-C1030 | VIIRS Cloud Base Height EDR - Official   | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X Volume IV Part 2 | EDRE-IMAG-C0030 | VIIRS I-Band Imagery EDR - Official<br>VIIRS Imagery Band 01 EDR<br>VIIRS Imagery Band 02 EDR<br>VIIRS Imagery Band 03 EDR<br>VIIRS Imagery Band 04 EDR<br>VIIRS Imagery Band 05 EDR | HDF5      | X   | X   |

| Data Document                                    | Data Mnemonic   | Data Description   | Data Type | HRD | LRD |
|--|-----------------|--|-----------|-----|-----|
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-IMAG-C1030 | VIIRS Near Constant Contrast Imagery EDR - Official  | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-OMTC-C0030 | OMPS Total Column Ozone EDR - Official   | HDF5      | X   |     |
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-VCCL-C0030 | VIIRS Cloud Cover/Layers EDR - Official  | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-VCEP-C0030 | VIIRS Cloud Effective Particle Size EDR - Official   | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-VCOT-C0030 | VIIRS Cloud Optical Thickness EDR - Official   | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-VCTH-C0030 | VIIRS Cloud Top Height EDR - Official  | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-VCTP-C0030 | VIIRS Cloud Top Pressure EDR - Official  | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-VCTT-C0030 | VIIRS Cloud Top Temperature EDR - Official   | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-VMOD-C0030 | VIIRS Moderate Band Imagery EDR - Official<br>VIIRS 1st M Band Imagery EDR<br>VIIRS 2nd M Band Imagery EDR<br>VIIRS 3rd M Band Imagery EDR<br>VIIRS 4th M Band Imagery EDR<br>VIIRS 5th M Band Imagery EDR<br>VIIRS 6th M Band Imagery EDR | HDF5      | X   | X   |
| D34862-04-02: NPOESS CDFCB-X<br>Volume IV Part 2 | EDRE-VRSM-C0030 | VIIRS Suspended Matter EDR - Official  | HDF5      | X   | X   |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-ICST-C1030 | VIIRS Ice Surface Temperature EDR - Official   | HDF5      | X   |     |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-SICH-C1030 | VIIRS Sea Ice Characterization EDR - Official  | HDF5      | X   |     |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-SNCD-C1030 | VIIRS Snow Cover/Depth Snow Fraction EDR - Official  | HDF5      | X   | X   |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-SNCD-C1035 | VIIRS Snow Cover/Depth Binary Map EDR - Official   | HDF5      | X   | X   |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-SSTE-C1030 | VIIRS Sea Surface Temperature EDR - Official   | HDF5      | X   | X   |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-VLST-C0030 | VIIRS Land Surface Temperature EDR - Official  | HDF5      | X   | X   |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-VNHF-C0030 | VIIRS Net Heat Flux EDR - Official   | HDF5      | X   |     |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-VROC-C0030 | VIIRS Ocean Color/Chlorophyll EDR - Official   | HDF5      | X   |     |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-VRVI-C0030 | VIIRS Vegetation Index EDR - Official  | HDF5      | X   | X   |
| D34862-04-03: NPOESS CDFCB-X<br>Volume IV Part 3 | EDRE-VSTV-C0030 | VIIRS Surface Type EDR - Official  | HDF5      | X   | X   |
| D34862-04-04: NPOESS CDFCB-X<br>Volume IV Part 4 | EDRE-VRSA-C0030 | VIIRS Surface Albedo EDR - Official  | HDF5      | X   | X   |