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APPROVALS

Authored By: RE Anthony Flores **Checked By: RE Claudina Tiznado**

AUTHORIZED SIGNATURES	REPRESENTING	DATE
	GPS Enterprise Space & Missile Systems Center (SMC) - LAAFB	
	HQ Air Force Space Command (USSF/50 OG)	
	Department of Homeland Security (OHS), United States Coast Guard (USCG), Navigation Center (NAVCEN)	
	Department of Transportation (DOT), Federal Aviation Administration (FAA)	

INTERFACE CONTROL DOCUMENT

UNLESS OTHERWISE SPECIFIED: NUMBERS ARE REPRESENTED IN DECIMAL FORM.

THIS DOCUMENT SPECIFIES TECHNICAL REQUIREMENTS AND NOTHING HEREIN CONTAINED SHALL BE DEEMED TO ALTER THE TERMS OF ANY CONTRACT OR PURCHASE ORDER BETWEEN ALL PARTIES AFFECTED

Interface Control Contractor:
SAIC (GPS SE&I)
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El Segundo, CA 90245

TITLE:
NAVSTAR Next Generation GPS Control Segment (OCX) to User Support Community Interface

SIZE A	CODE IDENT **66RP1**	NO. **ICD-GPS-870**
SCALE: N/A	REV: **E**	

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LTR	**DESCRIPTION**	**DATE**	**APPROVED**
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C	IRN-ICD-870B-001; RFC-308 Update ICD-GPS-870 and ICD-GPS-240 to align with new OCX to external agency interfaces IRN-ICD-870B-002; RFC 352 Update ICD-GPS-240 and ICD-GPS-870 for NANU Issuance IRN-ICD-870B-003; RFC-351 Message Updates to ICD-GPS-240 and ICD-GPS-87	25 Apr 2018	22 May 2018
D	IRN-ICD-870C-001; RFC-374 2018 Public Document Proposed Changes	05 Apr 2019	06 May 2019
E	IRN-ICD-870D-001; RFC-395 2018 Public Document Proposed Changes IRN-ICD-870D-002; RFC-395 2018 Public Document Proposed Changes IRN-ICD-870D-003; RFC-403 Health Bit Clarification	14 May 2020	

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1 SCOPE

1.1 Scope

This Interface Control Document (ICD) defines the Public Release products generated by the Global Positioning System (GPS) Control Segment (CS) and the GPS public User community during the GPS Next Generation Operational Control System (OCX) era. This ICD describes the GPS products provided by the CS and the means by which these GPS products are distributed.

The GPS CS is operated by the 2d Space Operations Squadron (2 SOPS), administratively organized under 50th Space Wing (50 SW). The GPS User and User-support communities are comprised of the Department of Homeland Security (DHS) United States Coast Guard (USCG); Department of Transportation (DOT), Federal Aviation Administration (FAA); other Civil Users; and various GPS Users.

All GPS products and tools described in this ICD are unclassified and are publicly releasable per the current GPS CS mode of operations and the 50th SW Memorandum for Record - 2 SOPS GPS Public Release Policy.

In order to support Users who may not be able to update their code, the ASCII text file formats, as defined in Appendices 1-5, are not changing and ASCII text file Users are assured that they can continue to use these file types in the OCX era without changes to their systems. At the same time, the GPS CS announces that it has deprecated the ASCII text file formats and does not intend to make any future updates to these formats. Instead, any future additions or changes will only be captured in the modernized XML format messages. The GPS CS will still be required to coordinate a specific timeframe or process in a public ICWG for the removal of a currently supported file format.

The new or modified file formats: .nnu (updated NANU), .ale (new ESHS), .blm (new YUMA), .bl3 (new SEM), .oa1 (updated OA) , and as2.txt (new A-S Status) handle a larger number of SVNs and/or PRNs and more clearly specify zero padding and whitespace so automated parsing can be done with fewer assumptions.

In this document, from here on, the term CS, which stands for Control Segment, will be used instead of OCX (where applicable). In the OCX era, the OCX System will be the GPS Control Segment; therefore, the CS will be performing the functions stated in this ICD.

1.2 Key Events and Transition Plans

The major milestone for implementation of this document is the initial operating capability of the GPS Next Generation Operational Control System (OCX). The Air Force will prepare for and assess operational readiness of OCX prior to deactivating the legacy control segment (AEP) and declaring OCX Ready to Transition to Operations (RTO).

The following transition strategy will ensure a low risk migration of users from the AEP era products (ICD-GPS-240) to the OCX era products (ICD-GPS-870), and then onward as future updates to OCX products are introduced;

a) The CS may introduce new products and standards, yet will provide a means for supporting backward compatibility.

b) New users and early adopters will be encouraged to adopt new products and features.

c) Existing products within the ICD which are planned for retirement will be deprecated prior to being retired thus providing advance warning for users to initiate and complete migration away from the deprecated products.

d) Users are encouraged to plan a migration to use the new GPS Products “as is” and thus eliminate the need for transition utilities.

e) The GPS CS will still be required to coordinate a specific timeframe or process in a public ICWG for the removal of a deprecated product or service with a minimum of 12 months notice.

The legacy AEP era Internet Web Site to the user community (i.e., ICD-GPS-240), currently https://gps.afspc.af.mil/gps, will be manually maintained for a period of time not less than 6 months following OCX being declared RTO, providing a transition window for public users to migrate from using the legacy 2 SOPS web site to use the USCG Navigation Information Service (NIS).

A standards based approach to the GPS Products is employed in order to minimize the impact to the user community during transition. As a result, there are a wide variety of development COTS tools available to the users to independently develop tools to process the new GPS Products in their native (i.e. XML) formats. Government agencies are encouraged to work through the GPS Community POC for assistance during the transition.

1.3 Interface Control Document Approval and Changes

The Interface Control Contractor (ICC), designated by the government, is responsible for the basic preparation, approval, distribution, and retention of the ICD in accordance with the Interface Control Working Group (ICWG) charter GP-03-001.

The following signatories must approve this ICD to make it effective.

1. Air Force Space Command (AFSPC), GPS Directorate (GP) Space and Missile Systems Center (SMC)

2. Air Force Space Command (AFSPC), 50th Space Wing (50 SW)

3. Department of Homeland Security (DHS), United States Coast Guard (USCG), Navigation Center (NAVCEN)

4. Department of Transportation (DOT), Federal Aviation Administration (FAA)

Initial signature approval of this ICD can be contingent upon a letter of exception delineating those items by paragraph numbers that are not a part of the approval. Such letter of exception can be prepared by any of the signatories and must be furnished to the ICC for inclusion in the printed distribution of the officially released version of the ICD.

Changes to the approved version of this ICD can be initiated by any of the signatories and must be approved by all above signatories. The ICC is responsible for the preparation of the change pages, change coordination, and the change approval by all signatories. Designated signatories can approve proposed changes to this ICD without any increase in the scope of a specific contract by so specifying in a letter of exception. Such letters of exception must be furnished to the ICC for inclusion in the released version of the approved change and in the printed distribution of the approved ICD.

Whenever all of the issues addressed by a letter of exception are resolved, the respective signatory shall so advise the ICC in writing. When a portion of the exceptions taken by a signatory are resolved (but not all), the signatory shall provide the ICC with an updated letter of exception. Based on such notifications - without processing a proposed interface revision notice (PIRN) for approval - the ICC will omit the obsolete letter of exception from the next revision of the ICD and will substitute the new one (if required).

The typical review cycle for a PIRN is 45 days after receipt by individual addressees unless a written request for a waiver is submitted to the ICC.

2 APPLICABLE DOCUMENTS

2.1 Government Documents

The following documents of the issue specified contribute to the definition of the interfaces in this ICD and form a part of this ICD to the extent specified herein.

Specifications

Federal

None

Military

None

Other Government Activity

N/A

Standards

Federal

Version 2.1 (June 2006)	NIEM Information Exchange Package Documentation (IEPD) Specification
NDR 1.3	National Information Exchange Model (NIEM) Naming Design Rules
September 2008	Global Positioning System Standard Positioning Service Performance Standard

Military

September 2010	Department of Defense Public Key Infrastructure Functional Interface Specification 3.0.

Other Publications

IS-GPS-200 Current Version	Navstar GPS Space Segment / Navigation User Interface
IS-GPS-705 Current Version	Navstar GPS Space Segment / User Segment L5 Interfaces

IS-GPS-800 Current Version	Navstar GPS Space Segment / User Segment L1C Interfaces
GP-03-001 Current Version	GPS Adjudication Working Group (AWG) and Rough Order of Magnitude (ROM)/ Impact Assessment (IA) Charter
MOA Current Version	Interagency Memorandum of Agreement with Respect to Support of Users of the Navstar Global Positioning System (GPS)
2017	Federal Radionavigation Plan (Signatories: Department of Homeland Security, Department of Transportation, Department of Defense)
MFR 30 June 2011	Department of the Air Force, 50th Space Wing (AFSPC) Memorandum for Record - 2 SOPS GPS Public Release Policy
6 February 2003	DODI 8500.2, Information Assurance (IA) Implementation
4 May 2011	United States Department of Defense X.509 Certificate Policy

2.2 Non-Government Documents

The following documents of the issue specified contribute to the definition of the interfaces in this ICD and form a part of this ICD to the extent specified herein.

Specifications

None

Standards

November 1999	W3C, XSL Transformations (XSLT) Version 1.0
January 2007	W3C, XSL Transformations (XSLT) Version 2.0
November 2008	W3C, Extensible Markup Language (XML) Version 1.0 (Fifth Edition)
June 2008	W3C, XML Signature Syntax and Processing (Second Edition)
October 2004	XML Schema Part 1: Structures, Second Edition, W3C Recommendation
October 2004	XML Schema Part 2: Structures, Second Edition, W3C Recommendation

Other Publications

None

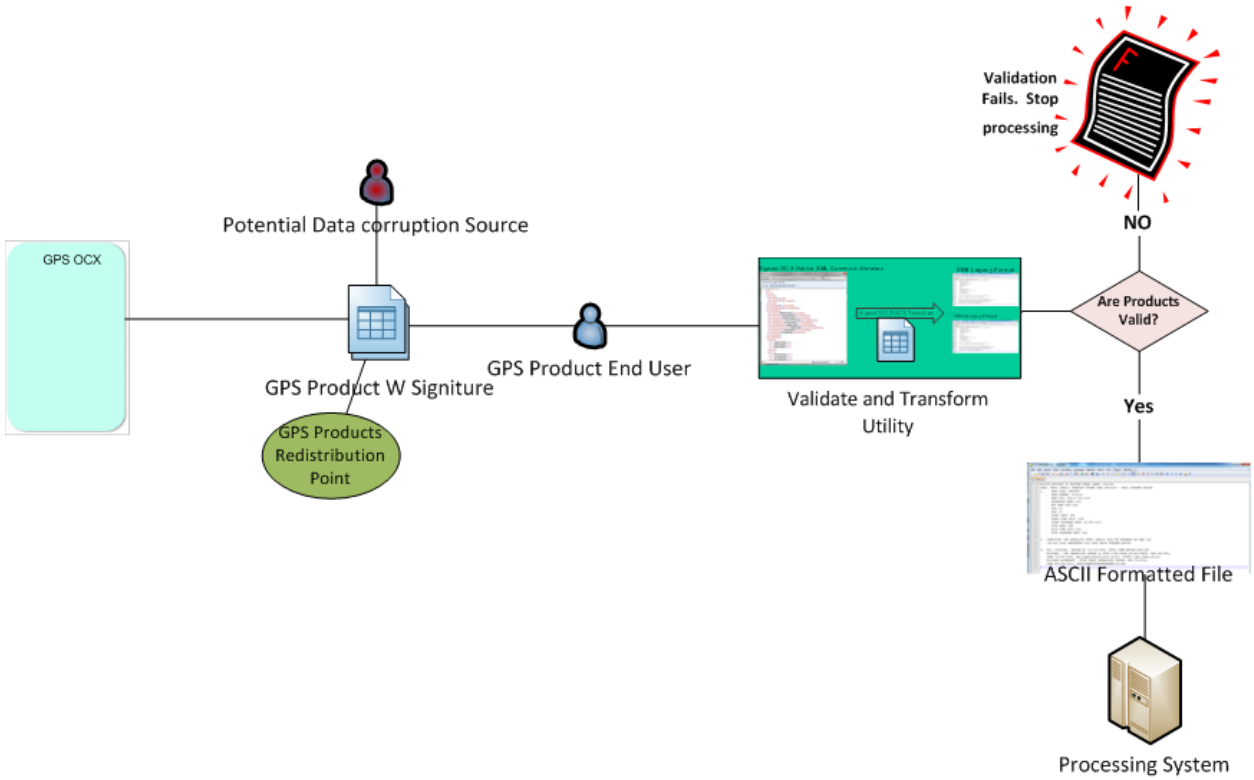
3 REQUIREMENTS

3.1 Interface Identification

The USCG provides a webpage accessible from the public Internet to allow users, with a standard web browser, to discover and retrieve publicly releasable GPS products.

Figure 3-1 depicts a generalized GPS Product Distribution Process which begins with a ***End-User*** interacting with a GPS Product redistribution node to retrieve the desired GPS Products. The diagram reflects that a ***potential data Corruption Source*** actor may introduce data corruption at any time during this re-distribution process. The GPS Product End-User may then validate and/or transform the Information Product before use in a Processing System. The roles of ***Potential Data Corruption Source*** and ***GPS Product End-User*** may be performed by the same or by different individuals.

Figure 3-1 Generic GPS Product Distribution Process



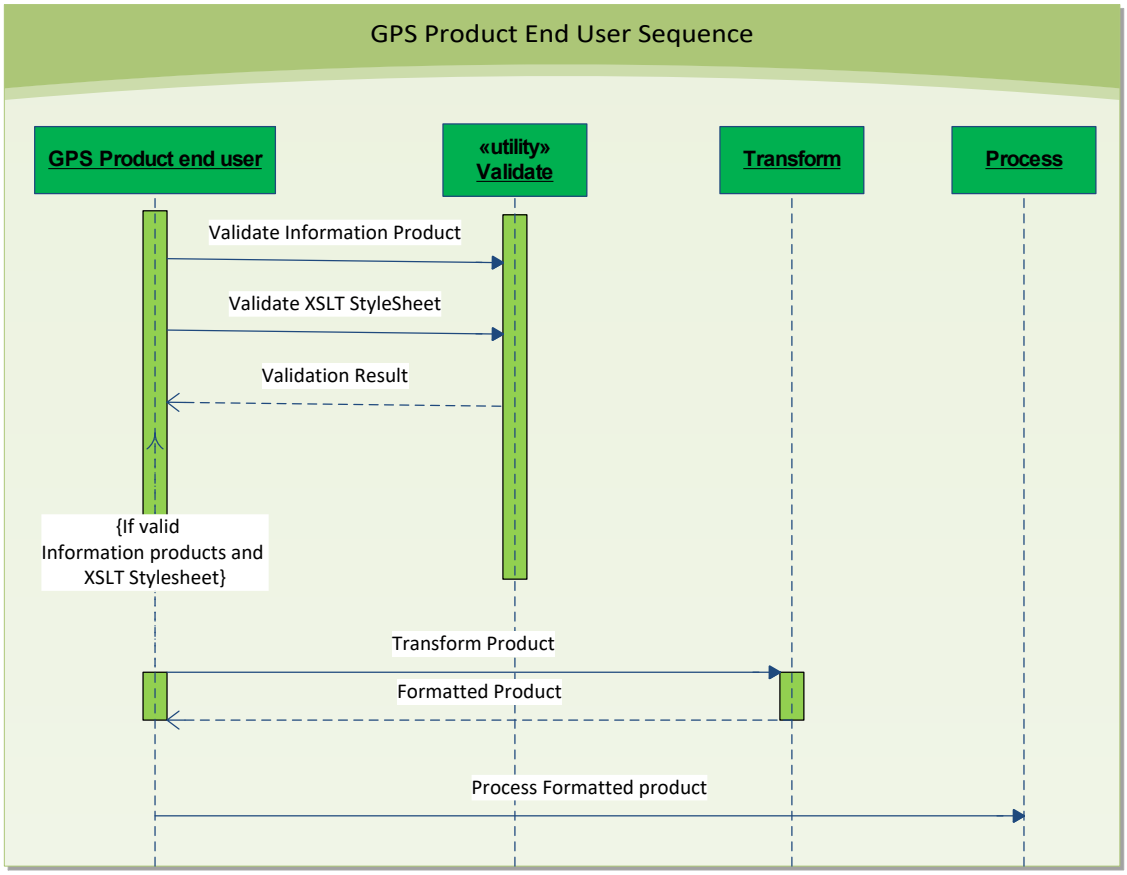
A GPS Product End User sequence diagram (see figure 3-2) is provided to further explain the intended use of the Validate and Transform Utility provided by the CS. An overview of the activities performed by the GPS Product End User follows;

a) Validate - an optional step performed by the end user to ensure that the GPS Products have not been corrupted through the process of redistribution

b) Transform - an optional step performed by end users who may need information in the ASCII text file formats before processing

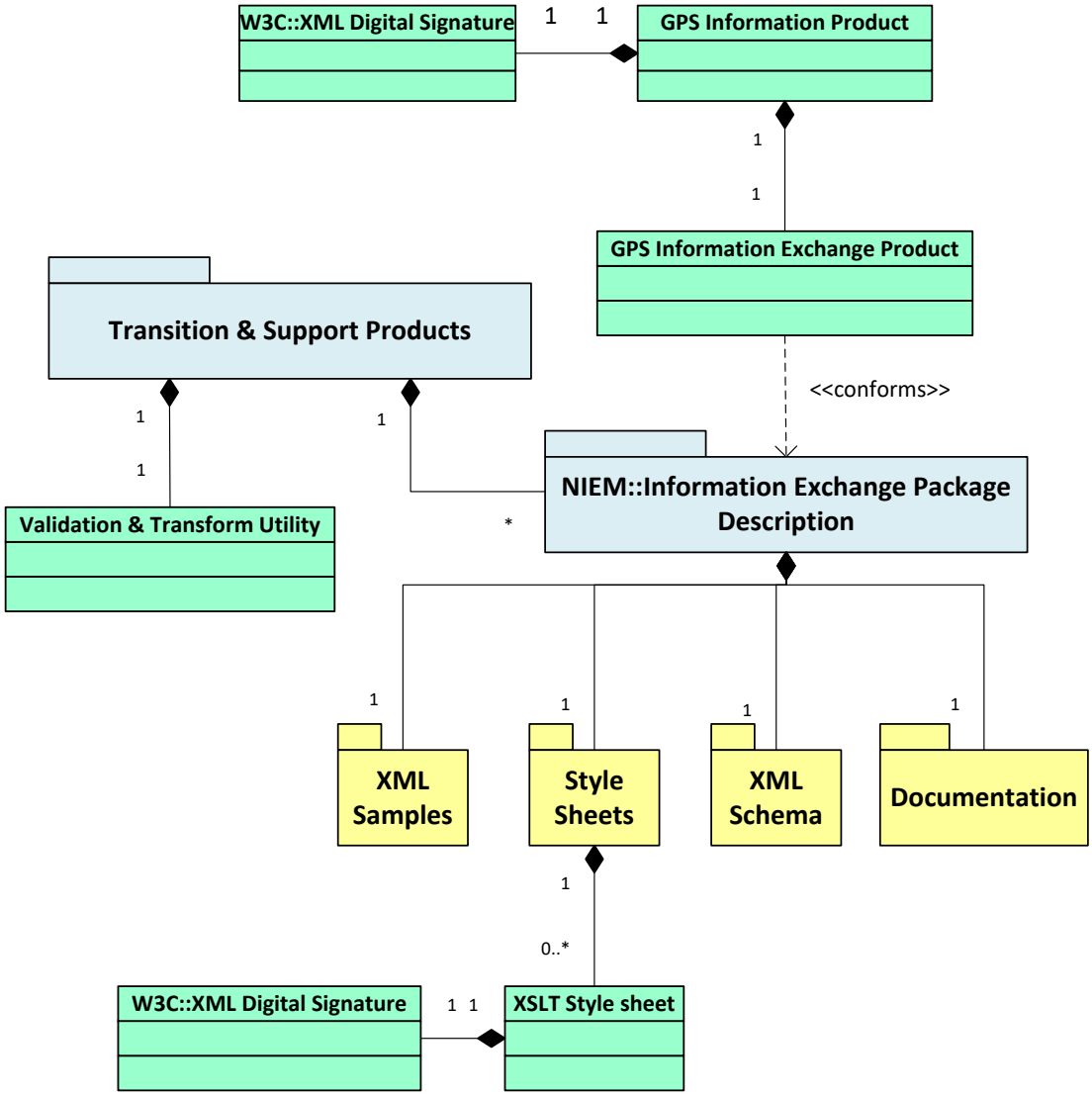
c) Process – use the GPS Information typically ingesting files using an end user Automated Information System (AIS)

Figure 3-2 GPS Product End User Sequence Diagram



This ICD defines and then uses a GPS domain specific information exchange vocabulary which users should adopt when discussing the public GPS products. Figure 3-3 depicts a high level entity relationship diagram summarizing the GPS Product Ontology. This ontology captures the modernized GPS Product relationships including compliance with the latest government standards for data sharing and interoperability including National Information Exchange Model (NIEM).

Figure 3-3 High Level GPS Product Ontology



Appendices 1-5 of this ICD document the minimum information content and formats which are required to achieve backward compatibility compliance. The GPS Ontology including Transition and Support Products will be published on the USCG Navigation Center website, currently https://www.navcen.uscg.gov.

The GPS CS will employ schema versioning whereby new data dissemination data/schema will be made available early in a pre-production form to allow synchronized development of automated ingestion and processing systems by users. In addition, operational data will be available in a production-full support form and in a production-deprecated form to allow graceful transition and retirement of obsolete data/schema.

The GPS CS XML based products will contain data sufficient to derive all ASCII text file content identified in Appendices 1-5.

The CS and the GPS Community will publish Information Products and Transition & Support Products. Products created by the CS have an associated XML Digital Signature as shown in Figure 3-3 and Figure 3-5.

a) CS produced Information Products provide users with information about the state/status of the GPS System.

b) GPS Community produced XML Schemas within the NIEM Information Exchange Package Description (IEPD) define the XML structures of the information products associated with this interface.

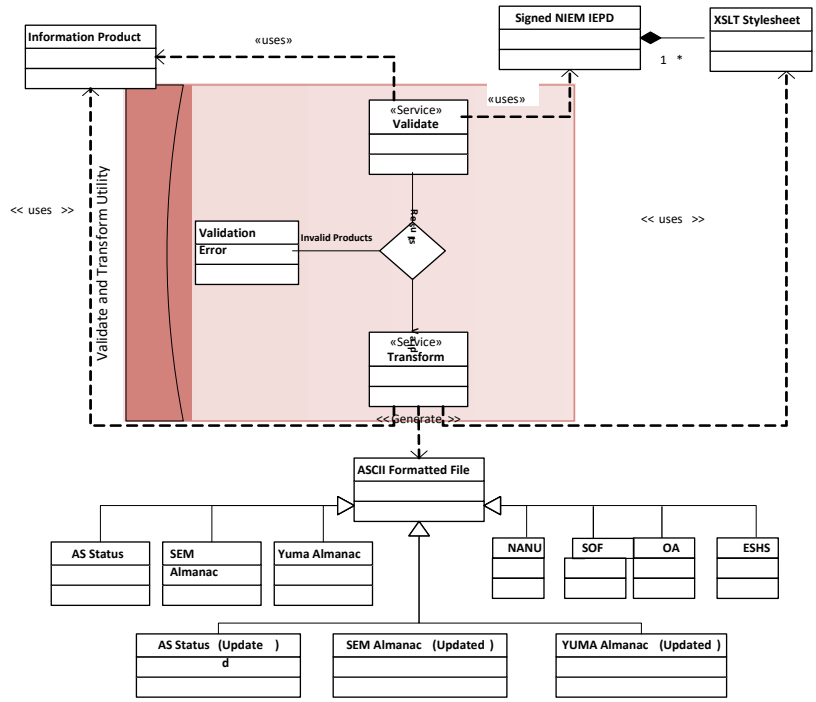
c) CS produced Style Sheets within the IEPDs can be used to transform an Information Product into one of several formats supporting full backward compatibility with the ASCII text file formats.

The CS will publish different kinds of Information Products listed in Table 3-I. These GPS information products correspond with all legacy signals and the new Civil signals L1C, L2C and L5.

The CS will provide a utility for users to validate data integrity and if required to transform an Information Product into backward compatible ASCII file formats (see Appendix 1-6).

This utility is provided to avoid the need for users to perform near term development prior to transition to the OCX RTO. Figure 3-4 depicts a high level entity relationship diagram summarizing the Validation and Transform Utility Ontology. Users are encouraged to plan a migration to use the new GPS Products in their native (i.e., XML) format and thus eliminate the need for this utility.

Figure 3-4 Validate and Transform Utility Ontology



The products defined in this ICD are listed in Table 3-I in the form of information exchange matrices.

The CS provides Information Products as shown in Table 3-I.

All GPS Information products will comply with XML schemas as listed in Table 3-III.

The GPS Community provides Public Releasable Transition and Support Products for GPS authoritative data as listed in Table 3-III.

The Validate and Transform Utility will allow the user to validate the digital signature of GPS Information Products and its associated NIEM IEPD.

Given validated inputs, the Validate and Transform Utility will use XSLT stylesheets to produce the desired output format as listed in Table 3-III.

The Validate and Transform Utility will output default filenames IAW Table 3-II.

When a major revision to the schema becomes operational, the superseded schema version will remain available for a period of no less than 1 year after the new major revision is operationally available.

Minor revisions will be backward compatible within the same major revision.

Table 3-I Information Product Information Exchange Matrix

Producer	Modern & Legacy Data Exchange Identification	Description	Security Classification
CS	Modern Identification: GPS Advisory Legacy Identification: Notice Advisory to Navstar Users (NANU)	The GPS Advisory exchange information product includes a single advisory notification concerning a GPS space event and associated GPS space vehicle. See GPS Advisory IEPD for more details. Published on a periodic basis, based on operational events/needs.	Unclassified / Open / Public Releasable
CS	Modern Identification: GPS Advisory Collection Legacy Identification: Satellite Outage File (SOF)	The GPS Advisory Collection Exchange information product includes a collection of advisory notifications of all available historical, current and predicted satellite outage space events. See GPS Advisory IEPD for more details. Produced in response to the generation of a GPS Advisory (NANU) by the CS.	Unclassified / Open / Public Releasable
CS	Modern Identification: Ops Status Legacy Identification: Operational Advisory (OA)	The Ops Status Exchange information product includes an Ops Status notification concerning the GPS constellation and relevant GPS space events. See Ops Status IEPD for more details. Nominally published once daily.	Unclassified / Open / Public Releasable
CS	Modern Identification: Public Common Almanac Legacy Identification: (1) GPS Almanacs (SEM,YUMA) (2) Anti-Spoof Status (3) ESHS	The Public Common Almanac Exchange information product includes orbital state and health status of the GPS constellation. See Public Common Almanac IEPD for more details. Nominally published once daily.	Unclassified / Open / Public Releasable

Table 3-II Default Filenames for Transformed Products

Legacy File Type (see Appendix ICD-GPS-870 Appendix 1-5)	Default Filename
NANU File (NANU)	yyyyNNN.nnu (see note 1 and 2 and 3)
Operational Advisory (OA)	yyyy_ddd.oa1 (see note 1 and 3)
SEM Almanac (PRN 1-32)	yyyy_ddd.al3 (see note 1 and 3)
SEM Almanac (PRN 1-63)	yyyy_ddd.bl3 (see note 1 and 3)
YUMA Almanac (PRN 1-32)	yyyy_ddd.alm (see note 1 and 3)
YUMA Almanac (PRN 1-63)	yyyy_ddd.blm (see note 1 and 3)
Anti-Spoof Status (AS) (PRN 1-32)	AS_yyyy_ddd.txt (see note 1 and 3)
Anti-Spoof Status AS2 (PRN 1-63)	AS2_yyyy_ddd.txt (see note 1 and 3)
Extended Signal Health Status	yyyy_ddd.ale (see note 1 and 3)
Satellite Outage File (SOF)	YYYY_DDD_HHMMSS_vnn.sof

Note 1:
- **yyyy is the year**
- **ddd is the 3 digit Julian day of year, zero-filled with a range from 001 to 366 beginning January 1**
- **hhmmss is the hour/minute/second UTC with hh range from 00 to 24 and with mm and ss range from 00 to 59**

Note 2:
- **NNN – sequentially assigned three-digit NANU ID number which begins at 001 for the first NANU of a new year. The ID number is incremented for each new NANU up to a maximum of 999 in any given calendar year, after which the ID number rolls over and begins numbering subsequent NANUs beginning with 001.**

Note 3:
- **The file is named with the reference date/time that the original GPS product was created by the CS.**

Note 4:
- **The nn is the file format version number and ranges from 01-09.**

Table 3-III Transition & Support Information Exchange Matrix

Producer	Data Exchange Identification	Information Description	Security Classification	Included Transformation Stylesheet(s)
GPS Community	GPS Advisory IEPD	A collection of artifacts that describe the construction and content (including schemas, transformation stylesheets, etc.) of a GPS Advisory information exchange. Published on a periodic basis with each new schema version.	Unclassified / Open / Public Releasable	NANU.XSL: Stylesheet for producing ASCII formatted ICD-870 Appendix 1 NANU Data Format. SOF.XSL: Stylesheet for producing ASCII formatted ICD-870 Appendix 3 Operational SOF Data Format.
GPS Community	Ops Status IEPD	A collection of artifacts that describe the construction and content (including schemas, transformation stylesheets, etc.) of a GPS Ops Status Advisory information exchange. Published on a periodic basis with each new schema version.	Unclassified / Open / Public Releasable	OpsAdvisory.XSL: Stylesheet for producing ASCII formatted ICD-870 Appendix 2 Operational Advisory Data File Format
GPS Community	Public Common Almanac IEPD	A collection of artifacts that describe the construction and content (including schemas, transformation stylesheets, etc.) of a GPS Public Common Almanac information exchange. Published on a periodic basis with	Unclassified / Open / Public Releasable	SEMAL3.XSL: Stylesheet for producing ASCII formatted ICD-870 Appendix 4 SEM (AL3) Almanac Data File Format SEMBL3.XSL: Stylesheet for producing ASCII formatted ICD-870 Appendix 4 SEM (BL3)

		each new schema version.		Almanac Data File Format
				YUMAALM.XSL: Stylesheet for producing ASCII formatted ICD-870 Appendix 4 YUMA (ALM) Almanac Data File Format
				YUMABLM.XSL: Stylesheet for producing ASCII formatted ICD-870 YUMA (BLM) Almanac Data File Format
				ESHSALE.XSL: Stylesheet for producing ASCII formatted ICD-870 Appendix 5 ESHS File Format
				ASStatus.XSL: Stylesheet for producing ASCII formatted ICD-870 Appendix 6 AS Status File Format
				ASStatus AS2.XSL: Stylesheet for producing ASCII formatted ICD-870 Appendix 6 AS Status File Format

The CS will employ schema versioning whereby new data/schema will be available in a non-operational pre-production form to support integration, test and transition. In addition, operational data will be available in a production-full support form and in a production-deprecated form to allow graceful transition and retirement of obsolete data/schema.

Note: Information on release of a new major schema revision will be accomplished through the public ICWG process.

3.1.1 GPS Control Segment

The GPS CS is operated by the 2d Space Operations Squadron (2 SOPS), administratively organized under 50th Space Wing (50 SW). The GPS CS operations are performed primarily via the Master Control Station (MCS), Alternate Master Control Station (AMCS), Monitor Stations (MS), and Ground Antennas (GA).

The MCS, located at Schriever Air Force Base (SAFB), is the central control point for the GPS CS. For this interface, the MCS is responsible for generating the Information Products in Table 3-I and providing these to the USCG NAVCEN for redistribution to the public. The AMCS, located at Vandenberg AFB (VAFB), is functionally identical to the MCS; either MCS facility is capable of controlling the GPS constellation for an indefinite period. In case the MCS experiences downtime, the AMCS takes over this interface function. The term “MCS”, as now used throughout this document, refers to either the MCS or the AMCS, whichever MCS facility actively controls the GPS constellation.

The MSs and GAs do not play a role in this interface.

As depicted in Figure 3-5, all GPS Information Products will comply with the following standards:

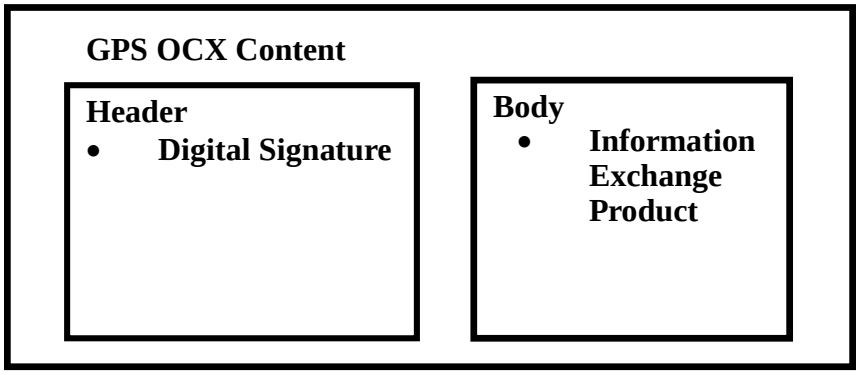
- W3C, Extensible Markup Language (XML)
- W3C XML Signature Syntax and Processing Standard

The stylesheet transformations within the IEPD, as depicted in Figure 3-3 and which can be used to convert Information Products into the various legacy formats, will comply with the following additional standard:

- W3C, XSL Transformations (XSLT)

The XML schema within the IEPD, as depicted in Figure 3-3, will comply with W3C XML Schema Standards.

Figure 3-5 GPS Product Structure (XML native)



3.1.2 GPS User and User-support communities

The GPS User and User-support communities include the Civil Users which are comprised of the Department of Homeland Security (DHS), United States Coast Guard (USCG); Department of Transportation (DOT), Federal Aviation Administration (FAA); other Civil Users.

3.2 Interface Definitions

3.2.1 Generation of Public Common Almanac Product

The GPS CS generates the Public Common Almanac Information Product for the GPS constellation. The satellite Common Almanac contains orbital and performance parameters for operational GPS satellites, the health status of each of the modernized civil signals available for each SV - L1C, L2C and L5, as well as A-S status Information. As shown in Table 3-III, two ASCII System Effectiveness Model (SEM) format Almanacs plus two ASCII YUMA format Almanacs and one ASCII Extended Signals Health Status (ESHS) format Almanac can be produced using the Common Almanac Information Product along with provided XSLT stylesheet. Detailed ASCII data formats of the SEM (current.al3 and current.bl3) and YUMA Almanac (current.alm and current.blm) data are described in Appendix 4 of this ICD. Detailed ASCII data formats of the ESHS Almanac data (current.ale) are described in Appendix 5 of this ICD.

3.2.2 Generation of Ops Status Product

The GPS CS will generate the Ops Status Information Product for the GPS constellation.

The Ops Status information product is a descriptive summary of GPS constellation status. As shown in Table 3-III, ASCII O-A formats can be produced using the Ops Status Information Product and the provided XSLT stylesheet. Detailed ASCII data formats of the OA data file (current.oa1) are described in Appendix 2 of this ICD.

3.2.3 Generation of GPS Advisory Product

The GPS CS will generate the GPS Advisory Information Product for the GPS constellation.

The GPS Advisory Information Product is a message that informs Users of satellite outages and other GPS issues. As shown in Table 3-III, the ASCII formats can be produced using the GPS Advisory Information Product and the provided XSLT stylesheet. Detailed ASCII data formats of the NANU (current.nnu) data are described in Appendix 1 of this ICD.

3.2.4 Legacy Anti-Spoofing (A-S) Status

The CS will generate newly created Public Common Almanac Information Product from which, as shown in Table 3-III, the Anti-Spoofing Status will be produced using the XSLT stylesheet. The detailed ASCII data formats of the A-S Status files (as.txt and as2.txt) are described in Appendix 6 of this ICD.

3.2.5 Data Distribution

The USCG provides a webpage accessible from the public Internet to allow users, with a standard web browser, to discover and retrieve publicly releasable GPS products.

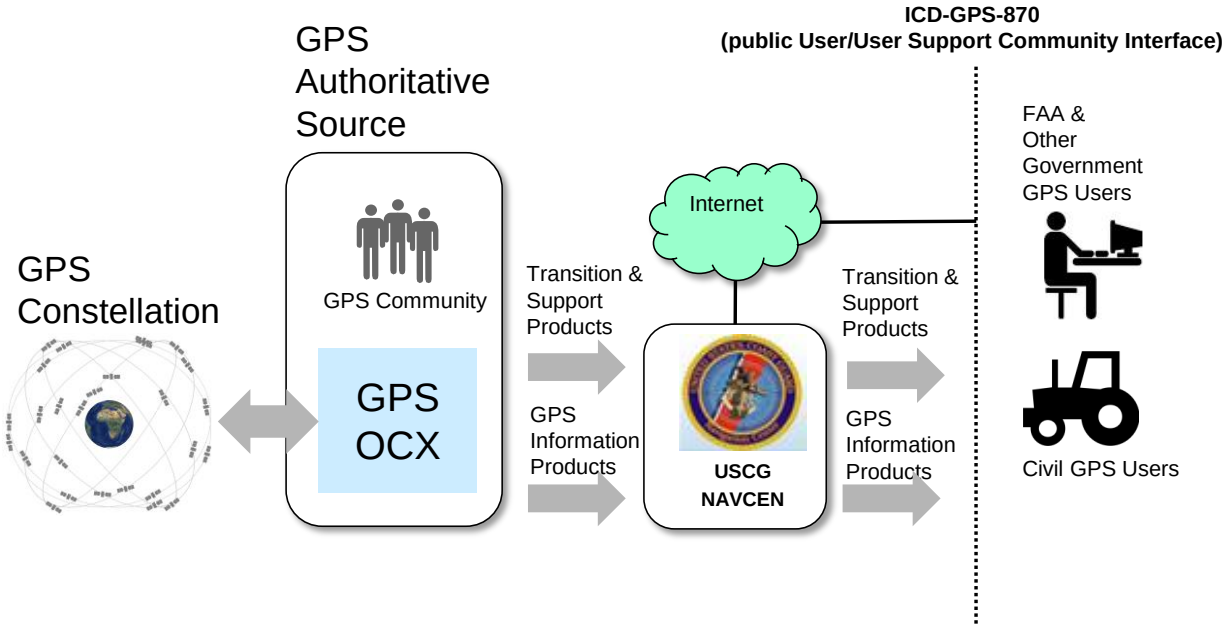


Figure 3-6 GPS Public Product Distribution Overview

As shown in Figure 3-6, the NAVCEN is the distribution point for authoritative GPS Products disseminated to the public. The NAVCEN receives these products from the GPS Control Segment (OCX) and the GPS community (led by the Air Force GPS Program Office). The GPS products consist of regularly published operational GPS information products (see Table 3-I) as well as Transition and Support Products (see Table 3-III).

GPS Advisory Information Products are provided whenever they are generated including weekends and holidays. Ops Status and Common Almanac Information Products are normally provided once per day, 24/7, 365 days a year, prior to 1700 Zulu time (10 am MST, 11 am MDT).

3.3 GPS MCS to GPS User Support Community Data Integrity

As the Authoritative Source for GPS Information Products described in this ICD, the CS publishes only digitally signed GPS Products to improve information assurance for GPS data at rest (i.e., resident on a storage device) within the GPS user community. Without digital signatures to ensure the integrity and proof of origin of the GPS Products at rest, Information Products originally from the CS could be corrupted (intentionally or unintentionally) during redistribution to the end user. The potential consequence of corrupted GPS Information products varies between end users. Some end users have Information Assurance critical applications (e.g. public utilities, safety of life systems) in which the potential consequence are significant and therefore unacceptable to the end user. Therefore;

a) The CS will only distribute GPS Products (see section 3.1.1) which are digitally signed XML documents per the published XML schema for compliance with modern Net Centric and Information Assurance standards for non-repudiation.

b) The GPS Community provides Digitally signed IEPDs which include XSLT stylesheets that can be used in conjunction with the Validate and Transform Utility to assist users with first validating then transforming GPS Information Products into backward compatible ASCII formats.

c) In order to maximize the benefit of information assurance, the CS recommends that End Users perform the transformation step as late as possible (just prior to ingesting).

d) Validating the data integrity of GPS products is optional and is the responsibility of the user. End users must apply their knowledge of the criticality of their application in making the determination of whether they can accept the risks of ignoring CS provided digital signatures.

e) Any US government user interested in redistributing GPS Products or products derived from GPS Products are advised to consult with the GPS Community before doing so to understand the tradeoffs and verify duplicative efforts are not being planned by the GPS Community.

Those consumers not interested in verifying the data integrity of GPS Information Products can simply use the messages. The requirement is upon the GPS CS to provide data integrity and it is OPTIONAL for the consumer to take the steps needed to verify the integrity of the data. The following paragraphs describe what the GPS CS is required to do and optionally what the consumer would need to do to verify that a message is genuine and originates from the GPS CS.

The GPS CS will use DoD Public Key Infrastructure (PKI) to digitally sign all GPS Products as listed in Tables 3-I and 3-III and as per Department of Defense Public Key Infrastructure Functional Interface Specification 3.0.

Digital signatures will use the Rivest-Shamir-Adleman (RSA) public key algorithm with 2048 bit keys and Secure Hash Algorithm-256 (SHA-256) for signatures.

As depicted in Figure 3-5, the header elements of the GPS Product OCX Content will contain the XML digital signature for the **entire** GPS Information Product (excluding the signature itself). This method of digital signing is referred to as an enveloped signature as defined in the W3C Signature Syntax Processing.

As shown in Figure 3-2, the steps for a user to verify the data integrity where the user has an application which directly processes ASCII text file formats:

1. Download the desired Information Product and associated IEPD (see Table 3-III) from USCG NAVCEN website or an alternate redistribution site. Note: Because the IEPD for an Information Product will change very infrequently, this step could be performed once for a new IEPD revision and then reused repeatedly without downloading again.

2. Just prior to use, validate the Digital Signature of the Information Product and the Signed IEPD containing the XSLT stylesheets using compliant standard COTS/Library and the currently published CS public certificate.
3. If the signatures do not validate in Step 2, then either the Information Product or the signed IEPD is not authentic (not produced by the CS) or has been corrupted. Do not use. The user should return to step 1.
4. If the signatures validate in both Step 2 and Step 3, then apply the XSLT stylesheet using standard COTS/Library to produce the desired ASCII file format.

Note: A user with a non-critical application who intends to bypass verifying data integrity only needs to perform Step 1 and then Step 4.

Note: The provided Validate and Transform Utility (see figure 3-4) can be used to perform steps 2, 3 and 4. The user is required to download/install the CS public key on their system prior to using the Validate and Download Utility.

As shown in Figure 3-2, the steps for a user to verify the data integrity where the user has a modern application which directly processes CS native XML formats;

1. Download the desired Information Product (see Table 3-III) from the USCG NAVCEN website.
2. Just prior to use, Validate the Digital Signature of Information Product using a W3C XML Digital Signature Compliant standard COTS/Library and the currently published CS public certificate.
3. If the signature does not validate in Step 2, then the Information product is either not authentic (not produced by the CS) or the information content has been corrupted. Do not use. The user should return to step 1.
4. If the signature validates in Step 2, then the GPS Information Product is authentic and the content has not been corrupted.

Note: A user with a modern non-critical application who intends to bypass verifying data integrity only needs to perform Step 1.

Note: The provided Validate and Transform Utility (see figure 3-4) can be used to perform step 2. The user is required to download/install the CS public key on their system prior to using the Validate and Download Utility.

The GPS CS will support modular addition or replacement of DoD PKI algorithms, key lengths, certificate authorities, certificates, and certificate structure. Coordination in a public ICWG will occur prior to any changes on the Public Release interface.

The GPS CS unclassified certificate (and corresponding CS public key) will be made available to all consumers for data integrity verification via the USCG NAVCEN website.

In this document, X.509 certificates are referred to as certificates.

DoD PKI root certificates are available on the DoD Class 3 Public Key Infrastructure (PKI) website, currently http://dodpki.c3pki.chamb.disa.mil/, to verify the certificate chain.

The USCG Website will make the standalone offline Validate and Transform utility available on the public Internet.

This utility will present the user with a simple User Interface to validate the integrity of any GPS Information Product and/or XSLT stylesheet included in the IEPDs as well as to optionally apply the appropriate XSLT stylesheet transform.

The CS Validate and Transform Utility will be installable on supported versions of Windows and Linux platforms.

User platform requirements for running the Validate and Transform Utility will be described on the USCG NAVCEN website. The Utility will be digitally signed and users should validate the Authenticity of the certificate during installation.

3.3.1 Digital Signatures

All of the GPS Information Products will be digitally signed.

All XSLT stylesheets will be signed using detached XML digital signatures with the signature stored on separate files as shown in Figure 3-3.

The CS will publish only digitally signed GPS Information Products to improve information assurance for GPS data at rest (ie. resident on a storage device) within the GPS user community as listed in Table 3-I.

A message will always have its corresponding signature available to the consumer to verify the message independent of the delivery protocol.

4 QUALITY ASSURANCE

Not Applicable

5 PREPARATION FOR DELIVERY

Not Applicable

6 NOTES

6.1 Acronyms and Abbreviations

2 SOPS	2d Space Operations Squadron
50 SW	50th Space Wing
A-S	Anti-Spoofing
AFB	Air Force Base
AFSPC	Air Force Space Command
AMCS	Alternate Master Control Station
ANOM	Anomaly
ASCII	American Standard Code for Information Interchange
CS	Control Segment, Cesium
DD	Calendar Day (2 digits)
DECOM	Decommission
DHS	Department of Homeland Security
DO	Director of Operations
DOD	Department of Defense
DOT	Department of Transportation
DSN	Defense Switched Network
DTG	Day Time Group
e-mail	Electronic mail
ESHS	Extended Signals Health Status
FAA	Federal Aviation Administration
FCSTCANC	Forecast Cancellation
FCSTDV	Forecast Delta-V
FCSTEXTD	Forecast Extension
FCSTMX	Forecast Maintenance
FCSTRESCD	Forecast rescheduled
FCSTSUMM	Forecast Summary
FCSTUUFN	Forecast Unusable Until Further Notice
G-NRN	Radio Navigation Division
GA	Ground Antenna
GP	Global Positioning System Directorate
GPS	Global Positioning System
GPSOC	GPS Operations Center
GPSW	GPS Wing
HDBK	Handbook
HH	Hour (2 digits)
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure

ICC	Interface Control Contractor
ICD	Interface Control Document
ICWG	Interface Control Working Group
ID	Identification
IERS	International Earth Rotation and Reference Systems Service
IP	Internet Protocol
IS	Interface Specification
JDAY	Julian Day of the Year
JJJ	Julian Date (3 digits)
LEAPSEC	Leap Second
LSB	Least Significant Bit
M	Meters
MCS	Master Control Station
MDT	Mountain Daylight Time
MIL	Military
MM	Minutes (2 digits)
MMM	Month (3 characters)
MOA	Memorandum of Agreement
MS	Monitor Station
MST	Mountain Standard Time
N/A	Not Applicable
NANU	Notice Advisory to Navstar Users
NAV	Navigation
NAVCEN	Navigation Center
NC	No Change
NNN	NANU Number (3 digits)
NOTAM	Notice to Airmen
OA	Operational Advisory
OCX	Next Generation Operational Control System
PIRN	Proposed Interface Revision Notice
PKI	Public Key Infrastructure
POC	Point Of Contact
PRN	Pseudorandom Noise (Signal Number)
RAD	Radians
RB	Rubidium
RFC	Request for Change
s	Seconds
SAFB	Schriever Air Force Base
SAIC	Science Applications International Corporation
SE&I	Systems Engineering and Integration

SEM	System Effectiveness Model
SIPRNet	Secret Internet Protocol Router Network
SMC	Space and Missile Systems Center
SPS	Standard Positioning Service
SQRT	Square Root
SUBJ	Subject
SS	System Specification
SSS	Seconds (3 digits)
STD	Standard
SV	Space Vehicle
SVID	Space Vehicle Identification
SVN	Space Vehicle Number
TBD	To Be Determined
TCP	Transmission Control Protocol
UNUNOREF	Unusable with no reference
UNUSABLE	Unusable with reference NANU
UNUSUFN	Unusable Until Further Notice
URA	User Range Accuracy
USABINIT	Initially usable
USCG	United States Coast Guard
USNOF	United States Notice to Airmen Office
USSPACECOM	United States Space Command
UTC	Coordinated Universal Time
VAFB	Vandenberg Air Force Base
WN	Week Number
YYYY	Year (4 digits)
Z	Zulu

7 APPROVAL

The signatories have approved this ICD with or without exception as their signature block implies and a copy of each approval sheet is included in this section.

10 APPENDIX 1: NANU DATA FORMATS

Appendix 1 describes the NANU types and the NANU message format.

10.1 Notice Advisory to Navstar Users

NANUs are used to notify Users of scheduled and unscheduled satellite outages and general GPS information. An outage is defined to be a period of time that the satellite is removed from service and not available for use. Operators determine the satellite meets the conditions for "unhealthy" provided in Section 2.3.2 of the Standard Positioning Service Performance guide. The paragraphs that follow describe the different types of NANUs. The NANU descriptions are arranged into four groups, as follows:

- Scheduled outages
- Unscheduled outages
- General text message
- Others

Users are advised that the Point of Contact (POC) information contained in the NANU samples are subject to change, specifically the Organization Name and Organization Primary Contact Information (i.e. Contact Website URI, Contact Email ID, Contact Telephone Number, and Contact DSN Telephone Number). The first NANU example, Figure 10-1, includes POC information that reflects the time of release of this ICD. However, users should refer to the POC information provided in the most recent NANUs for up-to-date information.

10.1.1 Scheduled Outages

NANU types in the scheduled outage group forecast outages that are planned to begin in the near future. Table 10-I identifies NANU types in the scheduled outage group. The table describes the NANU acronym used in the message format, the name of the file and a description of the outages. NANU acronyms in this group all begin with “FCST” for “forecast.”

Table 10-I Scheduled Outages

NANU ACRONYM	NAME	DESCRIPTION
FCSTDV	Forecast Delta-V	Scheduled outage times for Delta-V maneuvers.
FCSTMX	Forecast Maintenance	Scheduled outage times for non-Delta-V maintenance.
FCSTEXTD	Forecast Extension	Extends the scheduled outage time “Until Further Notice”; references the original forecast NANU.
FCSTSUMM	Forecast Summary	Exact outage times for the scheduled outage. This is sent after the maintenance is complete and the satellite is set healthy. It references the original forecast NANU. If a FCSTEXTD or a FCSTRESCD were required the FCSTSUMM will reference these.
FCSTCANC	Forecast Cancellation	Cancels a scheduled outage when a new maintenance time is not yet determined; it references the original forecast NANU message. May be issued after the start time of the referenced NANU.
FCSTRESCD	Forecast rescheduled	Reschedules a scheduled outage referencing the original-FCST NANU message.
FCSTUUFN	Forecast Unusable Until Further Notice	Scheduled outage of indefinite duration not necessarily related to Delta-V or maintenance activities.

The message templates for the NANU types listed in Table 10-I are shown in Figures 10-1 through 10-7, respectively.

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.     NANU TYPE: FCSTDV
       NANU NUMBER: YYYYSSS
                                        NANU DTG: DDHHMMZ MMM YYYY
       REFERENCE NANU: N/A
       REF NANU DTG: N/A
       SVN: XXX
       PRN: XX
       START JDAY: JJJ
       START TIME ZULU: HHMM
       START CALENDAR DATE: DD MMM YYYY
       STOP JDAY: JJJ
       STOP TIME ZULU: HHMM
       STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY) ENDING HHMM ZULU.

3.  POC: CIVIL NON-AVIATION - NAVCEN AT 703-313-5900, HTTPS://WWW.NAVCEN.USCG.GOV,
     CIVIL AVIATION - FAA NASEO AT 540-422-4178, HTTPS://WWW.FAA.GOV/AIR_TRAFFIC/NAS/GPS_REPORTS/,
     MILITARY - GPS OPERATIONS CENTER AT HTTPS://GPS.AFSPC.AF.MIL/GPSOC/, DSN 560-2541, COMM 719-567-
     2493, GPSOPERATIONSCENTER@US.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS/,
     MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-3514, COMM 805-606-3514,
     JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-1 FCSTDV NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
                  SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.      NANU TYPE: FCSTMX
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: N/A
        REF NANU DTG: N/A
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: JJJ
        STOP TIME ZULU: HHMM
        STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
(DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
ENDING HHMM ZULU.

3.  See Figure 10-1 for POC format
```

Figure 10-2 FCSTMX NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE EXTENDED UNTIL FURTHER NOTICE
1.      NANU TYPE: FCSTEXTD
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
```

Figure 10-3 FCSTEXTD NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE SUMMARY JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.      NANU TYPE: FCSTSUMM
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
                                                PRN: XX
        START JDAY: JJJ
```

Figure 10-4 FCSTSUMM NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE CANCELLED
1.      NANU TYPE: FCSTCANC
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: CANCELLED
        STOP TIME ZULU: N/A
        STOP CALENDAR DATE: N/A

2.  CONDITION: THE FORECAST OUTAGE FOR GPS SATELLITE SVNXXX (PRNXX) SCHEDULED FOR
    JDAY JJJ (DD MMM YYYY) BEGINNING HHMM ZULU HAS BEEN CANCELLED.

3.  See Figure 10-1 for POC format
```

Figure 10-5 FCSTCANC NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE RESCHEDULED
1.      NANU TYPE: FCSTRESCD
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: JJJ
        STOP TIME ZULU: HHMM
        STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
    ENDING HHMM ZULU. PLEASE REFERENCE NANU NUMBER YYYYNNN
    DTG DDHHMMZ MMM YYYY FOR THE ORIGINAL OUTAGE TIME.

3.  See Figure 10-1 for POC format
```

Figure 10-6 FCSTRESC NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM – UNTIL FURTHER NOTICE
1.      NANU TYPE: FCSTUUFN
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: N/A
        REF NANU DTG: N/A
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: UFN
        STOP TIME ZULU: N/A
        STOP CALENDAR DATE: N/A

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE NO EARLIER THAN JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL FURTHER NOTICE.

3.  See Figure 10-1 for POC format
```

Figure 10-7 FCSTUUFN NANU Message Template

10.1.2 Unscheduled Outages

NANU types in the unscheduled outage group describe unplanned outages that are ongoing or have occurred in the recent past. Table 10-II identifies NANU types in the unscheduled outage group. The table describes the NANU acronym used in the message format, the name of the file and a description of the outages. NANU acronyms in this group all begin with “UNU” or “UNUS” for “unusable.”

Table 10-II Unscheduled Outages

NANU ACRONYM	NAME	DESCRIPTION
UNUSUFN	Unusable Until Further Notice	Notifies Users that a satellite will be unusable to all Users until further notice.
UNUSABLE	Unusable with reference NANU	Closes out an UNUSUFN NANU and gives the exact outage times; references the UNUSUFN NANU
UNUNOREF	Unusable with no reference	Gives times for outages that were resolved before an UNUSUFN NANU could be sent.

The message templates for the NANU types listed in Table 10-II are shown in Figures 10-8 through 10-10, respectively.

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) UNUSABLE JDAY JJJ/HHMM - UNTIL FURTHER NOTICE
1.      NANU TYPE: UNUSUFN
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: N/A
        REF NANU DTG: N/A
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: UFN
        STOP TIME ZULU: N/A
        STOP CALENDAR DATE: N/A

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL FURTHER NOTICE.

3.  See Figure 10-1 for POC format
```

Figure 10-8 UNUSUFN NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) UNUSABLE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.      NANU TYPE: UNUSABLE
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: JJJ
        STOP TIME ZULU: HHMM
        STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
    ENDING HHMM ZULU.

3.  See Figure 10-1 for POC format
```

Figure 10-9 UNUSABLE NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) UNUSABLE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.      NANU TYPE: UNUNOREF
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: N/A
        REF NANU DTG: N/A
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: JJJ
        STOP TIME ZULU: HHMM
        STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
    ENDING HHMM ZULU.

3.  See Figure 10-1 for POC format
```

Figure 10-10 UNUNOREF NANU Message Template

10.1.3 General NANU Messages

General NANU messages describe a GPS issue, problem, or event deemed noteworthy to the GPS user community. General NANU topics may include but are not limited to failures in meeting SPS Performance Standard requirements, space segment problems that cannot be conveyed through other NANU formats, and space vehicle (SV) disposal announcements. NANU messages of this type are all identified with the “GENERAL” NANU acronym.

General NANU messages may be generically worded and may direct further detailed questions to the appropriate authorities. Recommendations or notes may be included, depending on the circumstances.

The GENERAL message structure is a text paragraph format, such as, the generic example shown in Figure 10-11. The format consists of two sections. Section one contains a header indicating the type of message. Section two is the body of the message.

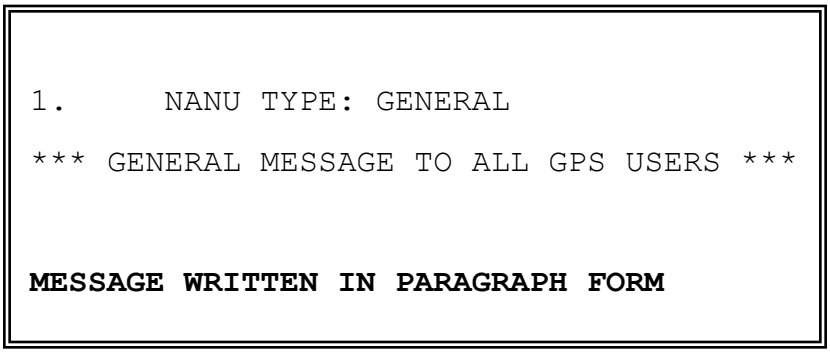


Figure 10-11 General Message Format

10.1.4 Other Messages

NANU types in the “other” group describe events that occur infrequently. Table 10-III identifies NANU types in the “other” outage group. The table describes the NANU acronym used in the message format, the name of the file and a description of the message.

Table 10-III Other Types of NANU Messages

NANU ACRONYM	NAME	DESCRIPTION
USABINIT	Initially usable	Notifies Users that an SV is set healthy for the first time.
LEAPSEC	Leap second	Notifies Users of an impending leap second.
LAUNCH	Launch	Notifies Users after the launch of a satellite.
DECOM	Decommission	Notifies Users that an SV has been removed from the current constellation identified within the broadcast Almanac, but does not necessarily signify permanent disposal.

The message templates for the NANU types listed in Table 10-III are shown in Figures 10-12 through 10-15, respectively.

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) USABLE JDAY JJJ/HHMM
1.     NANU TYPE: USABINIT
       NANU NUMBER: YYYYSSS
       NANU DTG: DDHHMMZ MMM YYYY
       REFERENCE NANU: N/A
       REF NANU DTG: N/A
       SVN: XXX
       PRN: XX
       START JDAY: JJJ
       START TIME ZULU: HHMM
       START CALENDAR DATE: DD MMM YYYY
       STOP JDAY: N/A
       STOP TIME ZULU: N/A
       STOP CALENDAR DATE: N/A

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS USABLE AS OF JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU.

3.  See Figure 10-1 for POC format
```

Figure 10-12 USABINIT NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: LEAP SECOND
1.  CONDITION: THE INTERNATIONAL EARTH ROTATION SERVICE (IERS) HAS ANNOUNCED THE
    INTRODUCTION OF A LEAP SECOND TO OCCUR AT THE END OF MMM YYYY

2.  COORDINATED UNIVERSAL TIME (UTC) WILL SEQUENCE AS FOLLOWS:
             DD MMM YYYY  HH HOURS MM MINUTES SS SECONDS
             DD MMM YYYY  HH HOURS MM MINUTES SS SECONDS
             DD MMM YYYY  HH HOURS MM MINUTES SS SECONDS

3.  FOR GPS, AS WITH PREVIOUS LEAP SECOND UPDATES, THE UTC DATA IN SUBFRAME 4, PAGE 18 OF
    THE NAVIGATION MESSAGE WILL CHANGE IN ACCORDANCE WITH IS-GPS-200.

    FOR GPS, IF/AS AVAILABLE, THE UTC DATA IN MESSAGE TYPE 33 OF THE CNAV DATA FOR L2C
    WILL CHANGE IN ACCORDANCE WITH IS-GPS-200.

    FOR GPS, IF/AS AVAILABLE, THE UTC DATA IN SUBFRAME 3, PAGE 1 OF THE CNAV-2 DATA FOR
    L1C WILL CHANGE IN ACCORDANCE WITH IS-GPS-800.

    FOR GPS, IF/AS AVAILABLE, THE UTC DATA IN MESSAGE TYPE 33 OF THE CNAV DATA FOR L5
    WILL CHANGE IN ACCORDANCE WITH IS-GPS-705.

    BEFORE THE LEAP SECOND
    GPS-UTC IS XX (GPS IS AHEAD OF UTC BY XX SECONDS)

    AFTER THE LEAP SECOND
    GPS-UTC WILL BE XX (GPS WILL BE AHEAD OF UTC BY XX SECONDS)

4.  See Figure 10-1 for POC format
```

Figure 10-13 LEAPSEC NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) LAUNCH JDAY JJJ
1.      NANU TYPE: LAUNCH
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        LAUNCH JDAY: JJJ
        LAUNCH TIME ZULU: HHMM

2.  GPS SATELLITE SVN XXX (PRN XX) WAS LAUNCHED ON JDAY JJJ A USABINIT NANU WILL BE SENT
    WHEN THE SATELITTE IS SET ACTIVE TO SERVICE.

3.  See Figure 10-1 for POC format
```

Figure 10-14 LAUNCH NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) DECOMMISSIONING JDAY JJJ/HHMM
1.     NANU TYPE: DECOM
       NANU NUMBER: YYYYSSS
       NANU DTG: DDHHMMZ MMM YYYY
       REFERENCE NANU: YYYYSSS
       REF NANU DTG: DDHHMMZ MMM YYYY
       SVN: XXX
       PRN: XX
       UNUSABLE START JDAY: JJJ
       UNUSABLE START TIME ZULU: HHMM
       UNUSABLE START CALENDAR DATE: DD MMM YYYY
       DECOMMISSIONING START JDAY: JJJ
       DECOMMISSIONING START TIME ZULU: HHMM
       DECOMMISSIONING START CALENDAR DATE: DD MMM YYYY


2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS UNUSABLE AS OF JDAY JJJ (DD MMM YYYY) AND
    REMOVED FROM THE GPS CONSTELLATION ON JDAY JJJ (DD MMM YYYY) AT HHMM ZULU.

3.  See Figure 10-1 for POC format
```

Figure 10-15 DECOM NANU Message Template

10.2 NANU Notification Times

NANU messages announcing scheduled events are normally distributed to the user community prior to the event. NANU messages announcing unscheduled events are normally distributed to the user community as soon as practical after the event. However, mission critical problems have priority over user notification and therefore may delay normal NANU distribution. NANU notification times typically vary by NANU group. Nominal and threshold NANU notification times for the four NANU groups are summarized in Table 10-IV.

Table 10-IV NANU Notification Times

NANU Group	Nominal Notification Times	Threshold
Scheduled	96 hours prior to outage start	NLT 48 hours prior to outage start (see note #1)
Unscheduled	15 minutes after outage start	Less than 1 hour after outage start
General	None – Timing determined on a case-by-case basis	
Other	None – Timing determined on a case-by-case basis	
NOTE 1: If the need for a planned outage is determined less than 48 hours prior to the start time of the outage, the associated Forecast NANU will not meet the Scheduled outage Threshold.		

The length of the outage time specified in scheduled NANU messages is typically longer than the expected maintenance time to allow for minor variations in the time required to accomplish a particular maintenance activity.

10.3 NANU Message Format

The NANU message structure for all messages, except the General, LAUNCH, DECOM, and LEAPSEC messages, is based on a tabular format that simplifies the readability of data. A template for these messages is illustrated in Figure 10-16. These messages are arranged into a header and three sections. The following paragraphs explain this message format in more detail.

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYNNN
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.  NANU TYPE: FCSTDV
     NANU NUMBER: YYYYNNN
     NANU DTG: DDHHMMZ MMM YYYY
     REFERENCE NANU: YYYYNNN
     REF NANU DTG: DDHHMMZ MMM YYYY
     SVN: XXX
     PRN: XX
     START JDAY: JJJ
     START TIME ZULU: HHMM
     START CALENDAR DATE: DD MMM YYYY
     STOP JDAY: JJJ
     STOP TIME ZULU: HHMM
     STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
     (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY) ENDING HHMM ZULU.

3.  See Figure 10-1 for POC format
```

Figure 10-16 NANU Message Template

10.3.1 NANU Header

The first line of the header includes the title “NOTICE ADVISORY TO NAVSTAR USERS (NANU)” and the assigned identification (ID) number for that NANU message. The ID number consists of the four-digit year followed by a sequentially assigned three-digit number which begins at 001 for the first NANU on the first day of a new year. The ID number is incremented for each new NANU up to a maximum of 999 in any given calendar year, after which the ID number rolls over and begins numbering subsequent NANUs beginning with 001. The second line identifies the subject of the message including the Space Vehicle Number (SVN), SV Pseudo Random Noise (PRN) number, type of message, and effective dates for the event. The three digit SVN field and two digit PRN number are zero padded. The date is in Julian day-of-year format (JDAY), numbered from 001 to 366, and the time is Zulu referenced in a 24-hour, two digit hour (HH) and two digit minute (MM) format. The NANU header is illustrated in Figure 10-17.

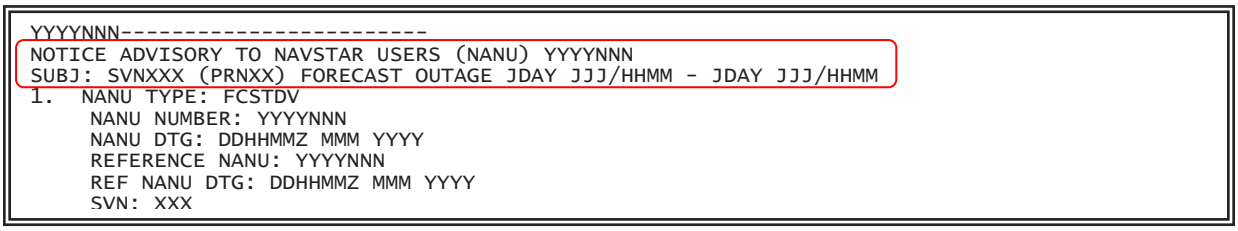


Figure 10-17 NANU Header

10.3.2 NANU Section 1

Section 1 provides the message description, reference information, satellite identification and outage time in a tabular format.

10.3.2.1 NANU Message Description

The message description includes the NANU type acronym, NANU number, and Day Time Group (DTG). The NANU type acronym is as previously described in paragraphs 10.1.1, 10.1.2, and 10.1.4. The NANU number is as previously described in paragraph 10.3.1. The DTG provides the date the NANU was created. The DTG format is represented as DDHHMM "Z" MMM YYYY. The first two digits identify the calendar day (DD) followed by the hour (HH) and minutes (MM). The letter Z indicates that the time is given in Zulu reference. This is followed by the first three letters of the month (MMM) and the four-digit year (YYYY). This portion of the message is illustrated in Figure 10-18.

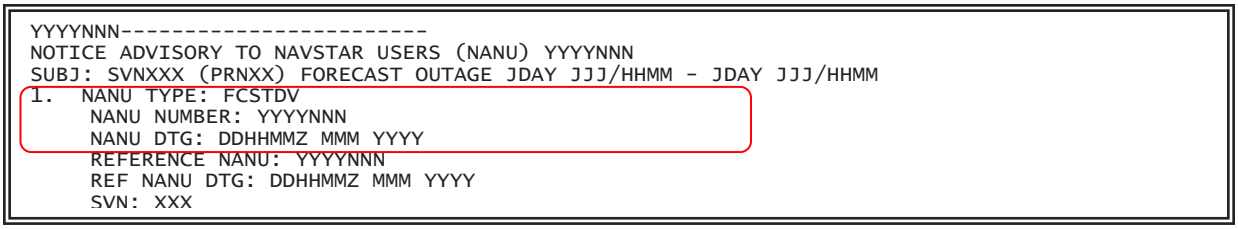


Figure 10-18 Message Description

10.3.2.2 NANU Reference Information

As shown in Figure 10-19, the reference information serves to close, extend, cancel, or reschedule previously broadcast messages. The data conveyed in this section includes the message ID number (YYYYNNN) and DTG (REF NANU DTG) of a previously broadcast message. Both of these items will be noted as N/A if the current message is not a follow up message.

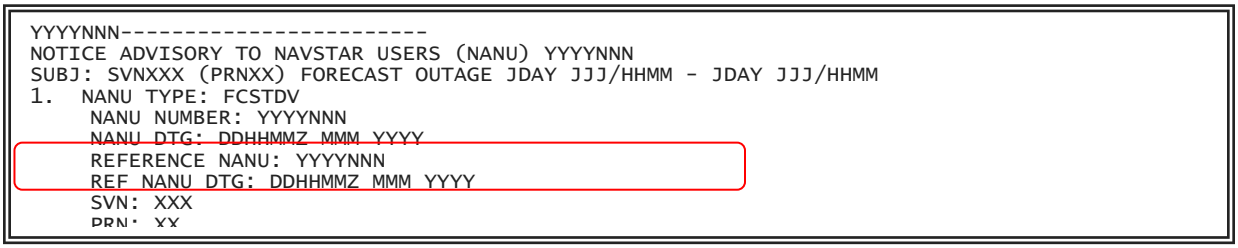


Figure 10-19 Reference Information

10.3.2.3 Satellite Identification

As shown in Figure 10-20, the satellite identification information specifies the satellite that is the subject of the NANU. The identification information includes the satellite three-digit SVN and two-digit PRN number. The SVN field and PRN number are zero padded.

```
YYYYNNN------------------------
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYNNN
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.  NANU TYPE: FCSTDV
     NANU NUMBER: YYYYNNN
     NANU DTG: DDHHMMZ MMM YYYY
     REFERENCE NANU: YYYYNNN
     REF NANU DTG: DDHHMMZ MMM YYYY
     SVN: XXX
     PRN: XX
     START JDAY: JJJ
     START TIME ZULU: HHMM
     START CALENDAR DATE: DD MMM YYYY
     STOP JDAY: JJJ
```

Figure 10-20 Satellite Identification Information

10.3.2.4 Outage Time

As shown in Figure 10-21, the outage time variables include start and stop dates and times. The start day is provided in three-digit Julian Day-of-Year format (JJJ = 001 to 366) as well as calendar day-month-year format. The calendar day is represented as two digits (DD), followed by the first three letters of the month (MMM) followed by the four-digit year (YYYY). The start time is given in Zulu time in a 24-hour, two-digit hour (HH), and two-digit minute (MM) format. The stop dates and time follow the same formats as the start dates and time.

```
YYYYNNN------------------------
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYNNN
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.  NANU TYPE: FCSTDV
     NANU NUMBER: YYYYNNN
     NANU DTG: DDHHMMZ MMM YYYY
     REFERENCE NANU: YYYYNNN
     REF NANU DTG: DDHHMMZ MMM YYYY
     SVN: XXX
     PRN: XX
     START JDAY: JJJ
     START TIME ZULU: HHMM
     START CALENDAR DATE: DD MMM YYYY
     STOP JDAY: JJJ
     STOP TIME ZULU: HHMM
     STOP CALENDAR DATE: DD MMM YYYY
```

Figure 10-21 Outage Time

10.3.3 NANU Section 2

As shown in Figure 10-22, Section 2 is a summary of the NANU in paragraph format including the satellite three-digit SVN and two-digit PRN number, text description of the event, start and stop date(s) in Julian and calendar date formats, and start and stop time(s) in Zulu hours and minutes. The SVN field and PRN number are zero padded.

```
2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
     (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY) ENDING HHMM ZULU.
```

Figure 10-22 NANU Section 2

10.3.4 NANU Section 3

Section 3 of the NANU identifies points of contact for additional technical and support information. An example of this section is illustrated in Figure 10-23.

```
3.  POC: CIVIL NON-AVIATION – NAVCEN AT 703-313-5900, HTTPS://WWW.NAVCEN.USCG.GOV,
CIVIL AVIATION – FAA NASEO AT 540-422-4178, HTTPS://WWW.FAA.GOV/AIR_TRAFFIC/NAS/GPS_REPORTS/,
MILITARY – GPS OPERATIONS CENTER AT HTTPS://GPS.AFSPC.AF.MIL/GPSOC/, DSN 560-2541, COMM 719-567-2493,
GPSOPERATIONSCENTER@US.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS/,
MILITARY ALTERNATE – COMBINED SPACE OPERATIONS CENTER, DSN 275-3522, COMM 805-605-3522,
JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-23 Contact Information

20 APPENDIX 2: OPERATIONAL ADVISORY DATA FILE

Appendix 2 describes the Operational Advisory message format.

20.1 Operational Advisory

The Operational Advisory (OA) message provides a summary of the satellite constellation status. An example is shown in Figure 20-1. The OA is arranged in three sections. The following paragraphs describe each section and subsection of the OA. Users are advised that the Point of Contact (POC) information contained in Section 3 of the OA samples are subject to change, specifically the Organization Name and Organization Primary Contact Information (i.e. Contact Website URI, Contact Email ID, Contact Telephone Number, and Contact DSN Telephone Number). The OA examples include POC information that reflects the time of release of this ICD. However, users should refer to the POC information provided in the most recent OAs for up-to-date information.

```
UNCLASSIFIED
GPS OPERATIONAL ADVISORY        086.OA1
SUBJ: GPS STATUS      27 MAR 2009

1. RESERVED
2. CURRENT ADVISORIES AND FORECASTS:
A. FORECASTS:           FOR SEVEN DAYS AFTER EVENT CONCLUDES.
NANU          MSG DATE/TIME       PRN  TYPE         SUMMARY (JDAY/ZULU TIME START - STOP)

2009022       261836Z MAR 2009    18   FCSTDV       092/1600-093/0630
B. ADVISORIES:
NANU          MSG DATE/TIME       PRN  TYPE         SUMMARY (JDAY/ZULU TIME START - STOP)

C. GENERAL:
NANU          MSG DATE/TIME       PRN  TYPE         SUMMARY (JDAY/ZULU TIME START - STOP)

2009020       202158Z MAR 2009         GENERAL      /-/
2009021       241836Z MAR 2009    01   LAUNCH       /-/
2009023       262212Z MAR 2009         GENERAL      /-/
3. REMARKS:
A.  THE POINT OF CONTACT FOR GPS MILITARY OPERATIONAL SUPPORT IS THE GPS
OPERATIONS CENTER AT HTTPS://GPS.AFSPC.AF.MIL/GPSOC/, DSN 560-2541, COMM 719-567-2493,
GPSOPERATIONSCENTER@US.AF.MIL,
B. CIVIL NON-AVIATION - NAVCEN AT 703-313-5900, HTTPS://WWW.NAVCEN.USCG.GOV,
C. CIVIL AVIATION - FAA NASEO AT 540-422-4178,
HTTPS://WWW.FAA.GOV/AIR_TRAFFIC/NAS/GPS_REPORTS/,
D. MILITARY ALTERNATE - COMBINED SPACE OPERATIONS CENTER, DSN 275-3522, COMM 805-605-3522,
JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 20-1 Sample Operational Advisory

20.2 OA Header.

The header includes the title “GPS OPERATIONAL ADVISORY,” the subject “SUBJ: GPS STATUS” and the date. The date is represented in a format that includes two-digit day (DD), the first three characters of the month (MMM), and four-digit year (YYYY). The OA header is illustrated in Figure 20-2.

```
UNCLASSIFIED
GPS OPERATIONAL ADVISORY        086.OA1
SUBJ: GPS STATUS      27 MAR 2009
```

Figure 20-2 OA Header

20.3 OA Section 1

Section 1 lists operational satellites by PRN number, assigned plane, and clock in current use. The PRN number is a two digit number that is zero padded. Subsection 1.A previously identified operational satellites in Block I. However, these satellites are no longer operational, so this subsection includes the word “NONE”. Subsection 1.B identifies satellites within Block II that are currently in use. Subsection 1.C identifies satellites within Block III that are currently in use. The example data shown for Section 1 is not meant to represent the actual GPS constellation configuration. The abbreviations CS and RB are used to indicate Cesium and Rubidium clocks, respectively. An example of section 1 of the OA is illustrated in Figure 20-3.

```
1. SATELLITES, PLANES, AND CLOCKS (CS=CESIUM RB=RUBIDIUM):
A. BLOCK I   : NONE
B. BLOCK II  : PRNS 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14
   PLANE     : SLOT B2, D1, C2, D4, B6, C5, A6, A3, A1, E3, D2, B4, F3, F1
   CLOCK     :      RB, RB, CS, RB, RB, RB, RB, CS, CS, CS, RB, RB, RB, RB
   BLOCK II  : PRNS 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
   PLANE     : SLOT F2, B1, C4, E4, C3, E1, D3, E2, F4, D5, A5, F5, A4, B3
   CLOCK     :      RB, RB, RB, RB, RB, RB, RB, RB, RB, CS, RB, RB, CS, RB
   BLOCK II  : PRNS 29, 30, 31, 32
   PLANE     : SLOT C1, B5, A2, E5
   CLOCK     :      RB, CS, RB, RB
C. BLOCK III: PRNS 33, 34, 35
   PLANE     : SLOT A2, C3, F4
   CLOCK     :      RB, RB, RB
```

Figure 20-3 OA Section 1

If no data are available, section one is denoted with "RESERVED." An example is illustrated in Figure 20-3a.

```
1. RESERVED
```

Figure 20-3a OA Section One (No Data)

20.4 OA Section 2

Section 2 contains a summary of current and recent advisories, forecasts, and general text messages. It is organized into three subsections. Subsection 2A summarizes scheduled NANU messages. Subsection 2B summarizes advisory messages (messages with prefix UNU). Section 2C summarizes general text messages. The PRN number is zero-padded. An example of section 2 of the OA is illustrated in Figure 20-4.

```
2. CURRENT ADVISORIES AND FORECASTS:
A. FORECASTS:            FOR SEVEN DAYS AFTER EVENT CONCLUDES.
NANU          MSG DATE/TIME       PRN  TYPE          SUMMARY (JDAY/ZULU TIME START - STOP)

2009022       261836Z MAR 2009    18   FCSTDV        092/1600-093/0630
B. ADVISORIES:
NANU          MSG DATE/TIME       PRN  TYPE          SUMMARY (JDAY/ZULU TIME START - STOP)

C. GENERAL:
NANU          MSG DATE/TIME       PRN  TYPE          SUMMARY (JDAY/ZULU TIME START - STOP)

2009020       202158Z MAR 2009         GENERAL       /-/
2009021       241836Z MAR 2009    01   LAUNCH        /-/
2009023       262212Z MAR 2009         GENERAL       /-/
```

Figure 20-4 OA Section 2

20.5 OA Section 3

Section 3 identifies points of contact for additional technical and support information. It is organized into three subsections, each in text format. An example of section 3 of the OA is illustrated in Figure 20-5.

```
3. REMARKS:
B.  THE POINT OF CONTACT FOR GPS MILITARY OPERATIONAL SUPPORT IS THE GPS
OPERATIONS CENTER AT HTTPS://GPS.AFSPC.AF.MIL/GPSOC/, DSN 560-2541, COMM 719-567-2493,
GPSOPERATIONSCENTER@US.AF.MIL,
B. CIVIL NON-AVIATION - NAVCEN AT 703-313-5900, HTTPS://WWW.NAVCEN.USCG.GOV,
C. CIVIL AVIATION - FAA NASEO AT 540-422-4178,
HTTPS://WWW.FAA.GOV/AIR_TRAFFIC/NAS/GPS_REPORTS/,
D. MILITARY ALTERNATE -  COMBINED SPACE OPERATIONS CENTER, DSN 275-3522, COMM 805-605-3522,
JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 20-5 OA Section 3

30 APPENDIX 3: SATELLITE OUTAGE FILE (SOF) FORMAT

Appendix 3 describes the SOF format.

Following is a list of the rules or protocols for the SOF data.

Usage Rules

1. The SOF always contains fields identifying creation date/time and reference date/time.
2. A new SOF is built each time a NANU is issued.
3. The latency of the SOF initially may be 15-20 minutes, and is driven by operational procedures and workload.

File Naming Convention

The most recently built SOF is given a standard name that contains the creation date/time and the file format version number, ‘yyyy_ddd_hhmmss_vnn.sof’, where yyyy is the year, ddd is the Jday (day of year starting with 1), hhmmss is the hour/minute/second UTC, and nn is the file format version number. The file format version number will increment sequentially whenever the file format changes.

Dissemination Methods

Unclassified Web Site. The GPSOC maintains a Web site accessible to unclassified military users worldwide. The current SOF is posted at a conspicuous spot on this Web site for download. All other worldwide, civil users may download the SOF from the U.S Coast Guard Navigation Center Web site.

Classification

The SOF is Unclassified and approved for public release. [Reference GPS Security Classification Guide, 30 Sep 2008, Topic Number 700.7.10]

Format

The SOF is formatted in XML according to the format below. The data type definition (DTD), the data format, and the data field definitions are provided.

A sample SOF with an internal DTD is as follows:

SOF DTD

```
<?xml version="1.0"?>
<!DOCTYPE GPSISFILE [
    <!ELEMENT GPSISFILE
(CREATION,REFERENCE,(PREDICTED|CURRENT|HISTORICAL)+)>
    <!ELEMENT CREATION EMPTY>
    <!ELEMENT REFERENCE EMPTY>
    <!ELEMENT PREDICTED EMPTY>
    <!ELEMENT CURRENT EMPTY>
    <!ELEMENT HISTORICAL EMPTY>
    <!ATTLIST GPSISFILE FILEID CDATA #FIXED "SOF">
    <!ATTLIST GPSISFILE SYSID CDATA #FIXED "GPS">
    <!ATTLIST GPSISFILE VERSION CDATA #REQUIRED>
    <!ATTLIST CREATION YEAR CDATA #REQUIRED>
    <!ATTLIST CREATION DOY CDATA #REQUIRED>
    <!ATTLIST CREATION HR CDATA #REQUIRED>
    <!ATTLIST CREATION MIN CDATA #REQUIRED>
    <!ATTLIST CREATION SEC CDATA #REQUIRED>
    <!ATTLIST REFERENCE YEAR CDATA #REQUIRED>
    <!ATTLIST REFERENCE DOY CDATA #REQUIRED>
    <!ATTLIST REFERENCE HR CDATA #REQUIRED>
    <!ATTLIST REFERENCE MIN CDATA #REQUIRED>
    <!ATTLIST REFERENCE SEC CDATA #REQUIRED>
    <!ATTLIST PREDICTED SVID CDATA #REQUIRED>
    <!ATTLIST PREDICTED SVN CDATA #REQUIRED>
    <!ATTLIST PREDICTED NAME (NANU|GOCGIS|USER_DEFINED) #REQUIRED>
    <!ATTLIST PREDICTED TYPE (FCSTDV|FCSTMX) #REQUIRED>
    <!ATTLIST PREDICTED REFERENCE CDATA #REQUIRED>
    <!ATTLIST PREDICTED START_YEAR CDATA #REQUIRED>
    <!ATTLIST PREDICTED START_DOY CDATA #REQUIRED>
```

<!ATTLIST PREDICTED START_HR CDATA #REQUIRED>

<!ATTLIST PREDICTED START_MIN CDATA #REQUIRED>

<!ATTLIST PREDICTED START_SEC CDATA #REQUIRED>

<!ATTLIST PREDICTED END_YEAR CDATA #REQUIRED>

<!ATTLIST PREDICTED END_DOY CDATA #REQUIRED>

<!ATTLIST PREDICTED END_HR CDATA #REQUIRED>

<!ATTLIST PREDICTED END_MIN CDATA #REQUIRED>

<!ATTLIST PREDICTED END_SEC CDATA #REQUIRED>

<!ATTLIST CURRENT SVID CDATA #REQUIRED>

<!ATTLIST CURRENT SVN CDATA #REQUIRED>

<!ATTLIST CURRENT NAME (NANU|GOCGIS|USER_DEFINED) #REQUIRED>

<!ATTLIST CURRENT TYPE CDATA #FIXED "UNUSUFN">

<!ATTLIST CURRENT REFERENCE CDATA #REQUIRED>

<!ATTLIST CURRENT START_YEAR CDATA #REQUIRED>

<!ATTLIST CURRENT START_DOY CDATA #REQUIRED>

<!ATTLIST CURRENT START_HR CDATA #REQUIRED>

<!ATTLIST CURRENT START_MIN CDATA #REQUIRED>

<!ATTLIST CURRENT START_SEC CDATA #REQUIRED>

<!ATTLIST HISTORICAL SVID CDATA #REQUIRED>

<!ATTLIST HISTORICAL SVN CDATA #REQUIRED>

<!ATTLIST HISTORICAL NAME (NANU|GOCGIS|USER_DEFINED) #REQUIRED>

<!ATTLIST HISTORICAL TYPE (FCSTSUMM|UNUSABLE|UNUNOREF) #REQUIRED>

<!ATTLIST HISTORICAL REFERENCE CDATA #REQUIRED>

<!ATTLIST HISTORICAL START_YEAR CDATA #REQUIRED>

<!ATTLIST HISTORICAL START_DOY CDATA #REQUIRED>

<!ATTLIST HISTORICAL START_HR CDATA #REQUIRED>

<!ATTLIST HISTORICAL START_MIN CDATA #REQUIRED>

<!ATTLIST HISTORICAL START_SEC CDATA #REQUIRED>

<!ATTLIST HISTORICAL END_YEAR CDATA #REQUIRED>

```
    <!ATTLIST HISTORICAL END_DOY CDATA #REQUIRED>
    <!ATTLIST HISTORICAL END_HR CDATA #REQUIRED>
    <!ATTLIST HISTORICAL END_MIN CDATA #REQUIRED>
    <!ATTLIST HISTORICAL END_SEC CDATA #REQUIRED>
]>
```

SOF Structure

```
<?xml version="1.0"?>
<GPSISFILE FILEID="SOF" SYSID="GPS" VERSION=”2”>
    <CREATION YEAR="2004" DOY="257" HR="11" MIN="2" SEC="11" />
    <REFERENCE YEAR="2004" DOY="257" HR="11" MIN="2" SEC="11" />
    <PREDICTED
        SVID="9" SVN="39"
        NAME="NANU" TYPE="FCSTMX" REFERENCE="2004094"
        START_YEAR="2004" START_DOY="229" START_HR="12" START_MIN="0"
    START_SEC="0"
        END_YEAR="2004" END_DOY="230" END_HR="0" END_MIN="0" END_SEC="0"
    />
    <CURRENT
        SVID="31" SVN="31"
        NAME="NANU" TYPE="UNUSUFN" REFERENCE="2004101"
        START_YEAR="2004" START_DOY="257" START_HR="5" START_MIN="50"
        START_SEC="0"
    />
    <HISTORICAL
        SVID="27" SVN="27"
        NAME="NANU" TYPE="UNUSABLE" REFERENCE="2004100"
        START_YEAR="2004" START_DOY="242" START_HR="1" START_MIN="32"
    START_SEC="0"
        END_YEAR="2004" END_DOY="243" END_HR="19" END_MIN="12"
    END_SEC="0"
    />
```

</GPSISFILE>

All times are UTC TIME (ZULU) unless otherwise specified. DOY is day of year (same as JDAY); 1=1 January, 366 is valid for leap year

'GPSISFILE' FILE INFORMATION

Occurs once per file

FILEID is always 'SOF'

SYSID is always 'GPS'

VERSION is the version number of the file. The version text should be an integer version number. Example: 2

CREATION indicates date/time of file creation. Time is computer time (UTC time zone).

REFERENCE indicates date/time to which SOF data applies. For example, if January 10, 2003 1550Z is the REFERENCE time then Satellite Outage information will be collected up to and including that time, including past, current, and predicted information. The REFERENCE time is set to be the date/time of the most recent NANU incorporated into the SOF.

'SOF_RECORD' INFORMATION

Occurs multiple times per file, once for each predicted, current or historical satellite outage issued by the REFERENCE data/time.

There are three types of SOF records.

PREDICTED identifies predicted outages as of the REFERENCE time.

CURRENT identifies any active outages as of the REFERENCE time, along with the time the outage began.

HISTORICAL identifies actual outages that have taken place prior to the REFERENCE time.

SVID - reusable identifier for each satellite in identified system. For GPS the SVID shall be the PRN.

SVN (Satellite Vehicle Number) – unique sequential number associated with satellite-specific program is an integer. For GPS this is assigned by the US Air Force.

PREDICTED record fields

NAME – Alphanumeric indicator of outage source (currently 'NANU'). GOCGIS used when no NANU has been issued, yet outage is predicted or a GENERAL NANU has been issued that affects this outage.

TYPE – If NAME=NANU, then the choices are FCSTDV, FCSTMX. If a FCSTEXTD, then implemented as original type (FCSTDV or FCSTMX) with start date/time the same as in the FCSTEXTD and end date/time fixed twenty years out. If FCSTRESCD, then implemented as original type with dates/times as in the FCSTRESCD NANU. If a FCSTCANC type NANU is issued, the original type will be deleted from the SOF.

REFERENCE – reference info. If NAME=NANU this will be the NANU number of the last valid NANU associated with this outage. For example, if there is a FCSTDV issued with number 2003010, then REFERENCE=2003010. As another example, if there is a FCSTMX issued with number 2003047, followed be a FCSTEXTD with number 2003050, then REFERENCE=2003050.

CURRENT record fields

NAME – Alphanumeric indicator of outage source (currently 'NANU').

TYPE – If NAME=NANU, then the choices are UNUSUFN and GENERAL. If NANU is initially issued as a GENERAL launch message, then it will be implemented in the SOF as a UNUSUFN with the start date/time as 0000Z on the first day the satellite appears in the almanac.

REFERENCE – reference info. If NAME=NANU this will be the NANU number of the last valid NANU associated with this outage. For example, if there is a UNUSUFN issued with number 2003049, then REFERENCE=2003049.

HISTORICAL record fields

NAME –Alphanumeric indicator of outage source (currently NANU).

TYPE – If NAME=NANU, then the choices are FCSTSUMM, UNUSABLE, UNUNOREF, USABINIT, and GENERAL. If NANU is initially issued as a GENERAL launch message, then it will be implemented in the SOF as an UNUSABLE with stop dates/times as in the USABINIT and the start date/time as 0000Z on the first day the satellite appears in the almanac. This closes out the UNUSUFN that was implemented earlier for the GENERAL launch message. If the NANU is initially issued as a GENERAL decommission it will be implemented in the SOF as an UNUSABLE with the decommission date/time as the end date/time. If a GENERAL NANU is issued which cancels a previous NANU, the previous NANU will not appear in the SOF.

REFERENCE – reference info. If NAME=NANU this will be the NANU number of the last valid NANU associated with this outage. For example, if there is a FCSTSUMM issued with number 2003051, then REFERENCE=2003051.

Format Changes

Changes to file formats are implemented as follows:

1. Files implementing a new format have the VERSION attribute of the GPSISFILE element incremented. Version 1 files encoded the file version in the filename. For example, a file with a previous format may have a name like 2004_202_145503_v01.sof. Later file versions encode the version both in the filename, and the XML VERSION attribute. The filenames of the new file versions look like 2004_202_145503_v02.sof.
2. If a new file format is implemented, both the old and the new file formats will be posted to the web site location for a transition period.
3. The old file format will be posted for six months, and then be removed. This provides time for users to adapt to the new file format.
4. Notifications of file format changes, with samples of the new format, will be published to www.GPS.gov when they are final.

40 APPENDIX 4: ALMANAC DATA FILES

Appendix 4 describes the SEM and YUMA Almanac message formats.

40.1 Almanac Description

The Almanac is a subset of GPS satellite clock and ephemeris data, with reduced precision. The CS provides the GPS Almanac in two formats, YUMA and System Effectiveness Model (SEM). Each Almanac format is broken into two files. YUMA files are named current.alm (PRNs 1-32) and current.blm (PRNs 1-63). SEM files are named current.al3 (PRNs 1-32) and current.bl3 (PRNs 1-63). The YUMA Almanac is an easy-to-read format of the Almanac data, while the SEM format is intended as input for software tools.

40.2 SEM Almanac Parameters Definition

The SEM Almanac parameters are defined in paragraph 20.3.3.5.1.2 of IS-GPS-200. The number of bits, scale factor for the least significant bit (LSB), range, and units of the Almanac parameters are specified in Table 20-VI of IS-GPS-200.

40.3 SV Health Word

While the orbital description data is generally usable for months, the satellite health may change at any time. The SEM and YUMA Almanac data formats also include an SV health word. The SV health word is defined in paragraph 20.3.3.5.1.3 and Table 20-VIII of IS-GPS-200. Table 40-I shows the 3 MCS health categories for satellites commonly used by 2 SOPS (ACTIVE, BAD & DEAD). The “OTHER” MCS health category is a generalized term for the remaining states/conditions defined by IS-GPS-200 which may be used by 2 SOPS in the future. Table 40-I also specifies the binary health words used in SV navigation (NAV) messages and the equivalent decimal representations used by both the SEM and YUMA Almanacs. The SV health word is found in cell R-7 of each record in the SEM Almanac. It is found on the third line of each record in the YUMA Almanac. Users of the SEM and YUMA Almanacs should be prepared for any potential future 2 SOPS use of other MCS health categories, as defined by codes in IS-GPS-200, Table 20-VIII.

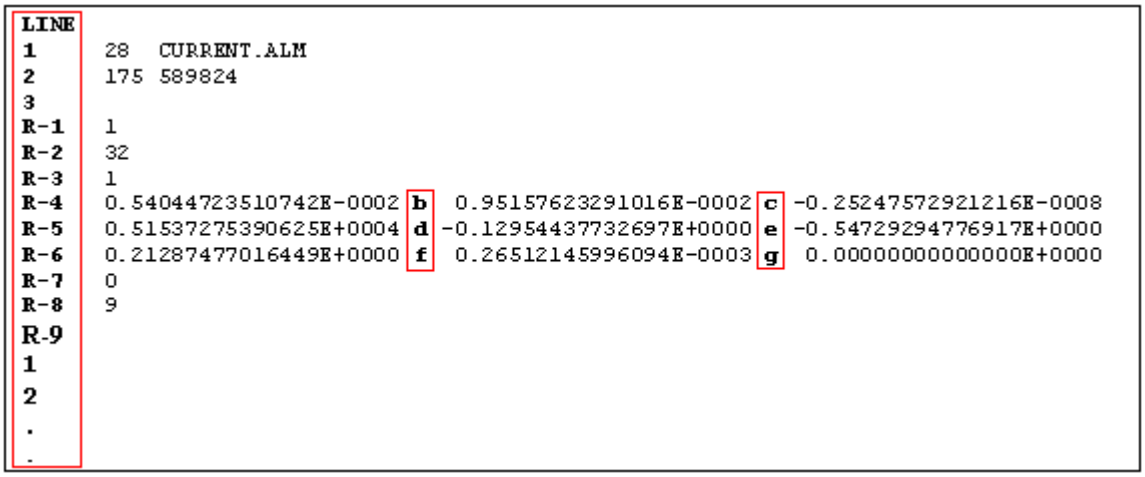
Table 40-I Six-Bit SV Health Word in Almanac

SV Health Category	Six Bit SV Health Word in NAV message	Numerical Representation of Six-Bit Health Word in SEM & YUMA Almanac
ACTIVE	000000	0
OTHER	000001	1
OTHER	000010	2
OTHER	000011	3
OTHER	000100	4
OTHER	000101	5
OTHER	000110	6
OTHER	000111	7
OTHER	001000	8
OTHER	001001	9
OTHER	001010	10
OTHER	001011	11
OTHER	001100	12
OTHER	001101	13
OTHER	001110	14
OTHER	001111	15
OTHER	010000	16
OTHER	010001	17
OTHER	010010	18
OTHER	010011	19
OTHER	010100	20
OTHER	010101	21
OTHER	010110	22
OTHER	010111	23
OTHER	011000	24
OTHER	011001	25
OTHER	011010	26
OTHER	011011	27
OTHER	011100	28
OTHER	011101	29
OTHER	011110	30
OTHER	011111	31
OTHER	100000	32
OTHER	100001	33
OTHER	100010	34
OTHER	100011	35
OTHER	100100	36
OTHER	100101	36
OTHER	100110	38
OTHER	100111	39
OTHER	101000	40
OTHER	101001	41
OTHER	101010	42

OTHER	101011	43
OTHER	101100	44
OTHER	101101	45
OTHER	101110	46
OTHER	101111	47
OTHER	110000	48
OTHER	110001	49
OTHER	110010	50
OTHER	110011	51
OTHER	110100	52
OTHER	110101	53
OTHER	110110	54
OTHER	110111	55
OTHER	111000	56
OTHER	111001	57
OTHER	111010	58
OTHER	111011	59
BAD	111100	60
OTHER	111101	61
OTHER	111110	62
DEAD	111111	63

40.4 SEM Almanac Format

The SEM format file example in Figure 40-1 is arranged with a header that identifies the number of records (number of satellites) and file name (current.al3). The SEM Almanac sample illustrated below is a data sample of one record out of 28 in this sample file and its parameter definition, as stated in the note of Figure 40-1, is in Table 40-II. There is an additional SEM file with a file name extension of .bl3 that is identical to .al3, except for the number of records range, PRN number range and SVN number field. All parameters are listed in Table 40-III.



LINE					
1	28 CURRENT.ALM				
2	175 589824				
3					
R-1	1				
R-2	32				
R-3	1				
R-4	0.54044723510742E-0002	**b**	0.95157623291016E-0002	**c**	-0.25247572921216E-0008
R-5	0.51537275390625E+0004	**d**	-0.12954437732697E+0000	**e**	-0.54729294776917E+0000
R-6	0.21287477016449E+0000	**f**	0.26512145996094E-0003	**g**	0.00000000000000E+0000
R-7	0				
R-8	9				
R-9					
1					
2					
.					
.					

Figure 40-1 SEM Data Sample for Current.al3

Note: The **bold** letters and numbers in the rectangles are not part of the SEM format; they are used for identification purposes in Table 40-II. Table 40-II identifies the characteristics of each parameter in the SEM Almanac.

Table 40-II SEM Almanac Description for Current.al3 (Sheet 1 of 2)

Line No.	Almanac Name	Description	Units	Range	Accuracy	Precision
1	Number of records	The number of satellite Almanac records contained in the file	Records	0 to 32	1	2 significant digits
	Name of Almanac	Descriptive name for the Almanac in the file	N/A	Any combination of valid ASCII characters	N/A	24 significant characters
2	GPS Week Number	The Almanac reference week number (WNa) for all Almanac data in the file	Weeks	0 to 1023 *	1	4 significant digits
	GPS Time of Applicability	The number of seconds since the beginning of the Almanac reference week. The Almanac reference time (t_{oa}) for all Almanac data in the file	Second	0 to 602,112	1	6 significant digits
3	Blank line for format spacing					
Record Format						
R-1	PRN Number	The satellite PRN number. This is a required data item as it is the GPS user's primary means of identifying GPS satellites. It is equivalent to the space vehicle identification (SVID) number of the SV	None	1 to 32	None	2 significant digits
R-2	SVN	The SV reference number. Unique sequential number associated with each satellite	None	0 to 255 (zero denotes that this field is empty)	None	3 significant digits
R-3	Average URA Number	The satellite "average" URA** number. This is not an item in the raw Almanac file but is based on the average URA value transmitted by this satellite in subframe 1. The URA is taken in the range of 730 hours	None	0 to 15	1	2 significant digits
R-4	Eccentricity	This defines the amount of the orbit deviation from a circular orbit (e)**	Unitless	0 to 3.125 E-2	4.77 E-7	7 significant digits

Table 40-II SEM Almanac Description for Current.al3 (Sheet 2 of 2)

Line No	Almanac Name	Description	Units	Range	Accuracy	Precision
b	Inclination Offset	Satellite Almanac orbital "inclination angle offset" (δ_i)** This does not include the 0.30 semicircle reference value (i_0)**	Semi circles	-6.25 E-2 to +6.25 E-2	1.91 E-6	7 significant digits
c	Rate of Right Ascension	Rate of change in the measurement of the angle of right ascension (Ω-DOT)**	Semi circles/ second	-1.1921 E-7*** to +1.1921 E-7***	3.64 E-12	7 significant digits
R-5	Square Root of Semi-Major Axis	Measurement from the center of the orbit to either the point of apogee or the point of perigee ($A^{1/2}$)**	$Meters^{1/2}$	0 to 8,192	4.88 E-04	9 significant digits
d	Geographic Longitude of Orbital Plane	Geographic longitude of the orbital plane at the weekly epoch" (Ω_0)**	Semi circles	-1.0 to +1.0	1.19 E-07	9 significant digits
e	Argument of Perigee	The angle from the equator to perigee (ω)**	Semi circles	-1.0 to +1.0	1.19 E-07	9 significant digits
R-6	Mean Anomaly	The angle which describes the position of the satellite in its orbit, relative to perigee. (M_0)**	Semi circle	-1.0 to +1.0	1.19 E-07	9 significant digits
f	Zeroth Order Clock Correction	The satellite Almanac zeroth order clock correction term (a_{f0})**	Seconds	-9.7657 E-4*** to +9.7657 E-4***	9.54 E-07	5 significant digits
g	First Order Clock Correction	The satellite Almanac first order clock correction term (a_{f1})**	Seconds/ second	-3.7253 E-9*** to +3.7253 E-9***	3.64 E-12	5 significant digits
R-7	Satellite Health	The satellite subframe 4 and 5, page 25 six-bit health code **	None	0 to 63	None	2 significant digits
R-8	Satellite Configuration	The satellite subframe 4, page 25 four-bit configuration code **	None	0 to 15	None	2 significant digits
R-9	Blank line for format spacing					

*GPS Week Number as distributed by the CS is a modulo 1024 (0-1023) decimal number representing the modulo 1024 binary week number broadcast from an SV (see IS-GPS-200). Some user applications (such as the SEM program) may require the user to replace the modulo 1024 week number in this format with the full decimal week number (e.g., 0-65,535) in order to determine the correct calendar date of the Almanac.
**As defined in IS-GPS-200.
***Rounded up from max range of IS-GPS-200 binary format.

Table 40-III SEM Almanac Description for Current.bl3 (Sheet 1 of 2)

Line No.	Almanac Name	Description	Units	Range	Accuracy	Precision
1	Number of records	The number of satellite Almanac records contained in the file	Records	00 to 63	1	2 significant digits
	Blank space for format spacing					
	Name of Almanac	Descriptive name for the Almanac in the file	N/A	Any combination of valid ASCII characters	N/A	24 significant characters
2	GPS Week Number	The Almanac reference week number (WNa) for all Almanac data in the file	Weeks	0 to 1023 *	1	4 significant digits
	Blank space for format spacing					
	GPS Time of Applicability	The number of seconds since the beginning of the Almanac reference week. The Almanac reference time (t_{oa}) for all Almanac data in the file	Second	0 to 602,112	1	6 significant digits
3	Blank line for format spacing					
Record Format						
R-1	PRN Number	The satellite PRN number. This is a required data item as it is the GPS user's primary means of identifying GPS satellites. It is equivalent to the space vehicle identification (SVID) number of the SV	None	01 to 63	None	2 significant digits
R-2	SVN	The SV reference number. Unique sequential number associated with each satellite**	None	000 to 255 (000 denotes that this field is empty)	None	3 significant digits
R-3	Average URA Number	The satellite "average" URA*** number. This is not an item in the raw Almanac file but is based on the average URA value transmitted by this satellite in subframe 1. The URA is taken in the range of 730 hours	None	0 to 15	1	2 significant digits
R-4	Eccentricity	This defines the amount of the orbit deviation from a circular orbit (e)***	Unitless	0 to 3.125 E-2	4.77 E-7	7 significant digits

Table 40-III SEM Almanac Description for Current.bl3 (Sheet 2 of 2)

Line No	Almanac Name	Description	Units	Range	Accuracy	Precision
b	Inclination Offset	Satellite Almanac orbital "inclination angle offset" (δ_i)*** This does not include the 0.30 semicircle reference value (i_0)***	Semi circles	-6.25 E-2 to +6.25 E-2	1.91 E-6	7 significant digits
c	Rate of Right Ascension	Rate of change in the measurement of the angle of right ascension (Ω-DOT)***	Semi circles/ second	-1.1921 E-7**** to +1.1921 E-7****	3.64 E-12	7 significant digits
R-5	Square Root of Semi-Major Axis	Measurement from the center of the orbit to either the point of apogee or the point of perigee ($A^{1/2}$)***	$Meters^{1/2}$	0 to 8,192	4.88 E-04	9 significant digits
d	Geographic Longitude of Orbital Plane	Geographic longitude of the orbital plane at the weekly epoch" (Ω_0)***	Semi circles	-1.0 to +1.0	1.19 E-07	9 significant digits
e	Argument of Perigee	The angle from the equator to perigee (ω)***	Semi circles	-1.0 to +1.0	1.19 E-07	9 significant digits
R-6	Mean Anomaly	The angle which describes the position of the satellite in its orbit, relative to perigee. (M_0)***	Semi circle	-1.0 to +1.0	1.19 E-07	9 significant digits
f	Zeroth Order Clock Correction	The satellite Almanac zeroth order clock correction term (a_{f0})***	Seconds	-9.7657 E-4**** to +9.7657 E-4****	9.54 E-07	5 significant digits
g	First Order Clock Correction	The satellite Almanac first order clock correction term (a_{f1})***	Seconds/ second	-3.7253 E-9**** to +3.7253 E-9****	3.64 E-12	5 significant digits
R-7	Satellite Health	The satellite subframe 4 and 5, page 25 six-bit health code ***	None	0 to 63	None	2 significant digits
R-8	Satellite Configuration	The satellite subframe 4, page 25 four-bit configuration code ***	None	0 to 15	None	2 significant digits
R-9	Blank line for format spacing					

*GPS Week Number as distributed by the CS is a modulo 1024 (0-1023) decimal number representing the modulo 1024 binary week number broadcast from an SV (see IS-GPS-200). Some user applications (such as the SEM program) may require the user to replace the modulo 1024 week number in this format with the full decimal week number (e.g., 0-65,535) in order to determine the correct calendar date of the Almanac.
** SVN Number as distributed by the CS is a modulo 256 (000-255) filled with leading zeros.
***As defined in IS-GPS-200.
****Rounded up from max range of IS-GPS-200 binary format.

40.5 YUMA Almanac Format

Parameters used in the YUMA format are not the same as used in the SEM format. The YUMA angular units are in radians whereas the SEM angular units are in semicircles. In addition, the YUMA Orbital Inclination is a direct measure of inclination angle (approximately 55 degrees), whereas the SEM Inclination Offset is relative to 0.30 semicircles (54 degrees). The parameters of the YUMA Almanac are identified within the message structure. Entries for ID, Health, and Week are represented in decimal format.

Figure 40-2 illustrates one record in a current.alm YUMA Almanac file sample. The maximum number of records in a current.alm file is 32 and this file addresses PRNs 1-32. Line one of each record identifies the week in which the file was generated as well as the PRN number of the subject SV. There is an additional YUMA file with a file name extension of .blm that is identical to .alm, except that it addresses PRNs 01-63 and the range of number of records or ID number in a current.blm file is 00-63.

```
******** Week 175 almanac for PRN-01 ********
ID:                         01
Health:                     000
Eccentricity:               0.5404472351E-002
Time of Applicability(s):   589824.0000
Orbital Inclination(rad):   0.9723724451
Rate of Right Ascen(r/s):  -0.7931758961E-008
SQRT(A)  (m 1/2):           5153.727539
Right Ascen at Week(rad):  -0.4069756641E+000
Argument of Perigee(rad):  -1.719371504
Mean Anom(rad):             0.6687658141E+000
Af0(s):                     0.2651214600E-003
Af1(s/s):                   0.0000000000E+000
Week:                        175
```

Figure 40-2 YUMA Almanac Data Sample For Current.alm

50 APPENDIX 5: EXTENDED SIGNALS HEALTH STATUS FILES

Appendix 5 describes the Extended Signals Health Status (ESHS) message format.

50.1 Extended Signals Health Status

The Extended Signals Health Status (ESHS) data message provides the health status of each of the modernized civil signals (L1C, L2C, and L5) for each SV, as defined in Table 50-I.

Table 50-I Modernized Civil Signals

Modernized Civil Signal	L1C	L2C	L5
Reference Document	IS-GPS-800	IS-GPS-200	IS-GPS-705
Applicable SV Block/Iteration	III, IIIF	IIR-M, IIF, III, IIIF	IIF, III, IIIF

The health indications for L1, L2, and L5 are defined in IS-GPS-200, paragraph 30.3.3.1.1.2.

The ESHS format, as shown in Figure 50-1, contains a header that identifies the number of records (number of satellites), filename (extension .ale), and the health of each signal as described above. The ESHS sample shown in Figure 50-1 depicts one data record out of 28 in this sample file.

LINE	**Parameter Name**	
1	# of Records/File Name	28 CURRENT.ALE
2	GPS Week #/GPS TOA	175 589824
3	Blank Line	
R-1	PRN	18
R-2	SVN	054
R-3	L1/L2/L5 Health Status	0-7 in binary format (000, 001, 010, 011, 100, 101, 110, 111)
R-4	Blank Line	

Note: The left columns are for information only and not part of the CURRENT.ALE file. The extended health Almanac sample (CURRENT.ALE) illustrated above is a data sample of one record out of 28 in this sample file.

After line R-4 of this example, lines R-1 through R-4 are repeated for each record in the CURRENT.ALE file.

Figure 50-I Extended Signals Health Status Data Sample

Table 50-II identifies the characteristics of each parameter in the ESHS message.

Table 50-II ESHS Description

Line No.	Parameter Name	Description	Units	Range	Accuracy	Resolution
1	Number of records	The number of satellite ESHS records contained in the file	Records	00 to 63	1	2 significant digits
	Blank space for format spacing					
	Name of ESHS file	Descriptive name for the ESHS file	N/A	Any combination of valid ASCII characters	N/A	24 significant characters
2	GPS Week Number	The Almanac reference week number (WNa) for all data in the file	Weeks	0 to 1023*	1	4 significant characters
	Blank space for format spacing					
	GPS Time of Applicability	The number of seconds since the beginning of the Almanac reference week for all data in the file.	Seconds	0 to 602,112	1	6 significant characters
3	Blank Line for Format Spacing					
Record Format						
R-1	PRN Number	The satellite PRN number. This is a required data item as it is the GPS user's primary means of identifying GPS satellites. It is equivalent to the Space Vehicle identification (SVID) number of the SV.	None	01-63	N/A	2 significant digits
R-2	SVN	The SV reference number. Unique sequential number associated with each satellite.	None	000-255 (000 denotes this field is empty)	N/A	3 significant digits
R-3	L1/L2/L5 Health Status	The health status of the L1/L2/L5 carrier is defined in section 30.3.3.1.1.2 of IS-GPS-200.	None	0-7 in binary format (000, 001, 010, 011, 100, 101, 110, 111)	N/A	3 significant characters
R-4	Blank Line for Format Spacing					

*GPS Week Number as distributed by the CS is a modulo 1024 (0-1023) decimal number representing the modulo 1024 binary week number broadcast from an SV (see IS-GPS-200). Some user applications (such as the SEM program) may require the user to replace the modulo 1024 week number in this format with the full decimal week number (e.g., 0-65,535) in order to determine the correct calendar date of the Almanac.

60 APPENDIX 6: ANTI-SPOOFING STATUS FILE

Appendix 6 describes the Anti-Spoofing Status message format.

60.1 Anti-Spoofing Status

The Anti-Spoofing (A-S) Status informs Users whether the Anti-Spoofing mode of each GPS SV is ON or OFF. There are two A-S Status files named as.txt and as2.txt. The message files are simple text files that identify each satellite in the GPS constellation by a two digit PRN number and a three digit SVN number and it shows the SV's A-S Status (ON/OFF). The difference between the two A-S Status files is the PRN Numbers. As.txt addresses PRNs 1-32 and as2.txt addresses PRNs 01-63. For the as2.txt file, the two digit PRN number and the three digit SVN field are zero padded. An example of the A-S Status (as.txt) is shown in Figure 60-1.

```
            Anti Spoofing (A-S) Status

                 PRN  SVN   A-S
                  1   049   ON
                  2   061   ON
                  3   033   ON
                  4   034   ON
                  5   050   ON
                  6   036   ON
                  7   048   ON
                  8   038   ON
                  9   039   ON
                 10   040   ON
                 11   046   ON
                 12   058   ON
                 13   043   ON
                 14   041   ON
                 15   055   ON
                 16   056   ON
                 17   053   ON
                 18   054   ON
                 19   059   ON
                 20   051   ON
                 21   045   ON
                 22   047   ON
                 23   060   ON
                 24   024   ON
                 25   025   ON
                 26   026   ON
                 27   027   ON
                 28   044   ON
                 29   057   ON
                 30   030   ON
                 31   052   ON
                 32   023   ON
```

Figure 60-1 Sample of the Anti-Spoofing Status file (as.txt)

70 APPENDIX 7: LETTERS OF EXCEPTION

70.1 Scope

As indicated in paragraph 1.3, initial signature approval of this document, as well as approval of subsequent changes to the document, can be contingent upon a "letter of exception". This appendix depicts such "letters of exception" when utilized by any signatory of this document in the initial approval cycle and/or in the change approval process. The ICC will omit such letters of exception from subsequent revisions of this document based on written authorization by the respective signatory (without processing a proposed interface revision notice (PIRN) for approval). When some (but not all) of the exceptions taken by a signatory are resolved, the signatory shall provide the ICC with an updated letter of exception for inclusion in the next ICD revision (without processing a PIRN for approval).

70.2 Applicable Documents

The documents listed in Section 2.1 shall be applicable to this appendix.

70.3 Letters of Exception

If signature approval of this document -- as affixed to the cover page -- is marked by an asterisk, it indicates that the approval is contingent upon the exceptions taken by that signatory in a letter of exception. Any letter of exception, which is in force for the revision of the ICD is depicted in Figure 70-1. Signatories for whom no letter of exception is shown have approved this version of the document without exception.

Figure 70-1 Letter of Exception