Global Positioning Systems (GPS) Public Interface Control Working Group and Public Forum

21-22 September 2016
0830 – 1630 hrs PST

United States Air Force GPS Directorate
Phone Number: 1-310-653-2663 Meeting ID: 6272252 Passcode: 000001
DCS Website: https://conference.apps.mil/webconf/gpspublicmeeting

Opening Remarks

Colonel Gerard G. Gleckel

Deputy Director, Global Positioning Systems (GPS) Directorate Space and Missile Systems Center

Roll Call

Agenda – Day 1 (Public ICWG)

Opening Remarks

Roll Call

Agenda Overview

Meeting Logistics / Rules of Engagement

Meeting Purpose

ICWG Presentations

- Request for Change (RFC) 308: Update Interface Control Document (ICD)-GPS-870 and Interface Control Document (ICD)-GPS-240

- Request for Change (RFC) 312: Definition Clarification for Time of Predict

- Request for Change (RFC) 318: 2016 Public Document Clean-Up

- Review of 2015 Comment Resolution Matrix

Action Item Review

Adjourn

Agenda – Day 2 (Public Forum)

Reconvene

Roll Call

Special Topic Presentations

- Appendix D to the Standard Positioning Service (SPS) Performance Standard (PS)
- Release of Receiver Independent Exchange Format (RINEX) Data from Control Segment to Civil Users
- Message Type 38
- Carrier Phase Noise via 3rd Order Jaffe-Rechtin Phase-locked loop (PLL)
- Operational Advisories
- How a Change in Interface Specification (IS)-GPS-705 and Interface Specification (IS)-GPS-800 Could Save Lives
- GPS Technical Baseline Overhaul *(Tentative)*

Open Discussion Session

Action Item Review

Adjourn

GPS Requirements Team

Air Force

James Horejsi, GPS Chief Engineer

Daniel Godwin, GPS Requirements Section Chief

Capt Robyn Anderson, User/Ground Requirements Engineer

Capt Jenny Ji, Space/Enterprise Requirements Engineer

Bruce Charest, Section Support Engineer

Aerospace

Karl Kovach

Rhonda Slattery

Systems Engineering and Integration (SE&I)

Pauline Bennett

Omar Menjivar

Huey Nguyenhuu

George Farmer

Christy Carter

Meeting Logistics

- Parking
- Restrooms
- Emergency Exits
- Refreshments
- Lunch
- Wi-Fi
- Additional Meeting Space
- Meeting Minutes

Rules of Engagement

UNCLASSIFIED

ABSOLUTELY NO PROPRIETARY, CLASSIFIED, OR COMPETITION SENSITIVE INFORMATION IS TO BE DISCUSSED DURING THIS MEETING.

Rules of Engagement

- Please place your phones on mute when not speaking to minimize background noise
- Comments against the topics listed on the official agenda will get priority during discussion
- Topics that warrant additional discussion may be side-barred
- Ad-hoc topics may be discussed during the open discussion on 22 Sep 16
- Meeting minutes and final IRNs will be generated and distributed as a product of this meeting via GPS.gov
- Please announce your name and organization before addressing the group

Meeting Purpose

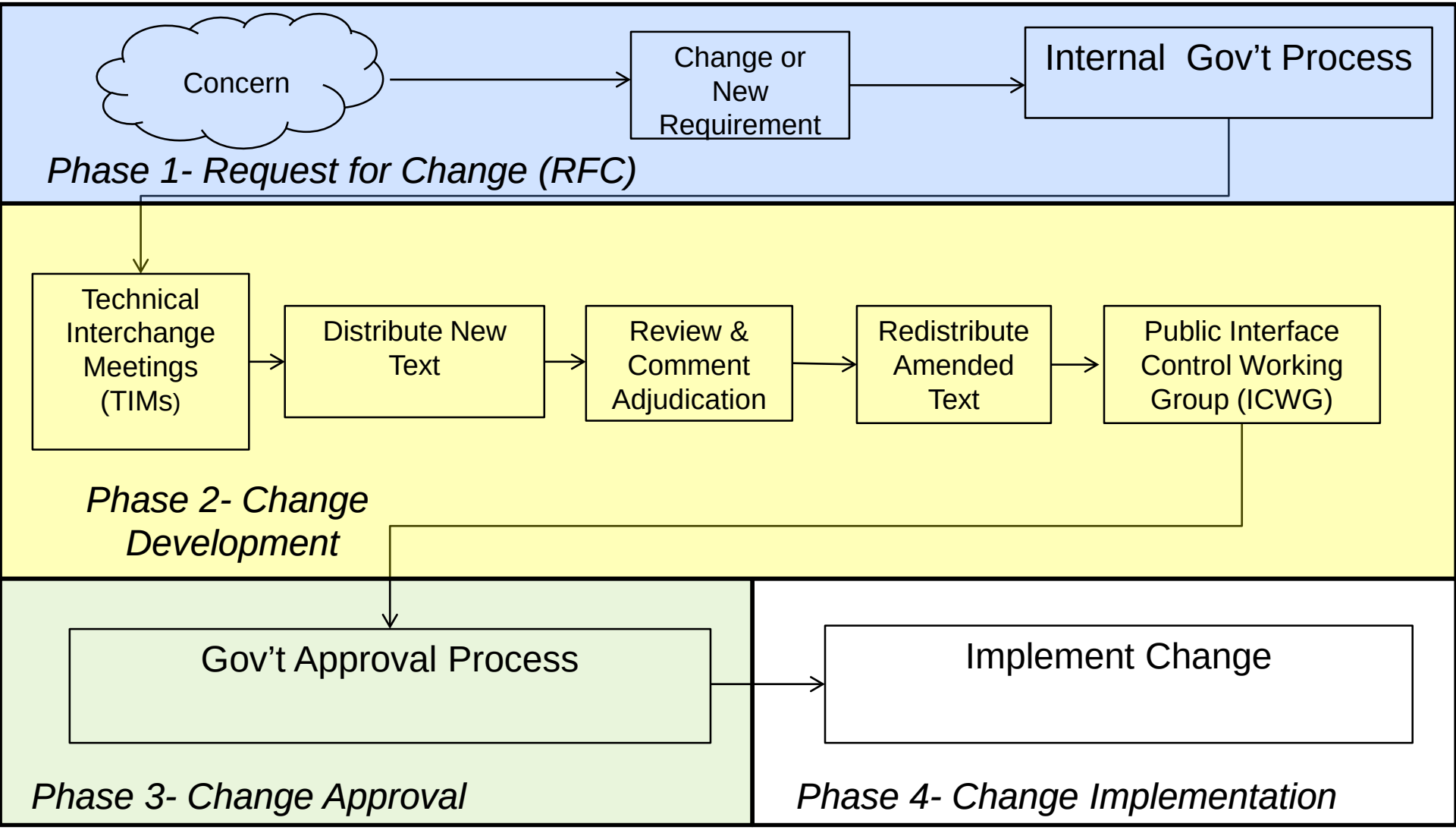
- The purpose of the meeting is to:

1) Obtain ICWG approval on the proposed language generated for the enterprise RFCs that may impact the public documents

2) Discuss any new open forum items against the Public Signals in Space documents

Comments received will be vetted per the standard change management process

Change Management High Level Process Flow



2016 PUBLIC INTERFACE CONTROL WORKING GROUP

ICWG Introduction

Ground Rules

- Please begin each comment by stating your name and organization
- Keep your comments within the scope of the proposed changes
- Any additional, out-of-scope changes can be submitted to the GPS directorate via the provided pre-RFC submission forms
- The proposed changes reflect updates to the CCB-approved version of the public documents, which served as the baseline (i.e., WAS) for the reviewed materials
- These presentations contain all submitted comments that are:
  - Critical
  - Substantive
  - Administrative (Rejected Only)
- Additional concerns can be submitted via concern forms, GPS.gov, or emailed to smcgper@us.af.mil

Updates to the Change Review Process

- The GPS Directorate has received numerous comments highlighting the cumbersome nature of reviewing proposed interface revision notices (PIRNs)
- The SE&I team is working tirelessly to update the process used to release PIRNs so materials are presented in an efficient, readable manner
- Periodic updates will be provided to technical baseline change review stakeholders on progress with this effort
- Any further discussions on this topic will be deferred and additional comments can be submitted to the GPS Directorate via smcgper@us.af.mil

{TEMPLATE for CRM Status}

CRM – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS					
Disposition/Type	**Critical**	**Substantial**	**Administrative**	**Totals**	**Concurrence**
Accept	##	##	##	##	##
Accept with Comment	##	##	##	##	##
Reject	##	##	##	##	##
Defer	##	##	##	##	##
Grand Totals:	##	##	##	##	##

Affected Document(s)	{List document(s)}	**DOORS ID**	{DOORS ID}
Paragraph	{Insert text here}	**Comment Number**	{from CRM}
Comment Type	{Critical/Substantive/Admin}	**Disposition**	{Accept/Accept w/ Comment/Reject/Defer}
Comment Originator(s)	Commenter Name (Commenter Organization)		
Comment	{what was submitted by the commenter in the CRM}		
Directorate Response	{Text describing the rationale of the disposition}		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
{Text shown in current version of CCB-approved interface revision notice}	{Text from PIRN}	{Proposed text received by the commenter during the PIRN review}

{TEMPLATE for Comment Adjudication}

Update ICD-GPS-870 and ICD-GPS-240

ICD: Interface Control Document

J. Ji
G. Farmer

RFC-308
Update ICDs 240 and 870

Problem Statement:
ICD-GPS-870 needs to be updated to describe the data format changes for the public users of the United States Coast Guard (USCG) data. This will also address numerous formatting errors in the publicly released version of ICD-GPS-870. ICD-GPS-870 and ICD-GPS-240 require updates to clarify Notice Advisory to NAVSTAR Users (NANU) outage codes.
Proposed Solution:
Update the descriptions of the data public users can access on the US Coast Guard server in ICD-GPS-870. Add a definition of “outage” for NANU messages to ICD-GPS-240 and to ICD-GPS-870.
Impacted Documents:
ICD-GPS-240 and ICD-GPS-870

RFC 308 CRM Status

CRM – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS					
Disposition/Type	**Critical**	**Substantial**	**Administrative**	**Totals**	**Concurrence**
Accept	7	7	20	34	33
Accept with Comment	5	5	0	10	9
Reject	1	2	0	3	2
Defer	0	5	0	5	0
Grand Totals:	13	19	20	52	44

Critical Comments (13)

Substantive Comments

Rejected Administrative Comments

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-88
Paragraph	10.1	**Comment Number**	ARC_1, RTN_01
Comment Type	Critical	**Disposition**	Reject
Comment Originator(s)	John Lavrakas (Advanced Research Corp), Alex Snyder (Raytheon)		
Comment	JL: Add definition for outage AS: Please either delete new insert or edit with suggested change. Additional statement and reference to documents that describe "unhealthy" could imply new functionality on control segment (CS) to automatically send NANU when section 2.3.2 for an unhealthy satellite vehicle (SV) is met.		
Directorate Response	The outage definition was ok but reviewers objected to the sentence describing “unhealthy” and thought it added more confusion than clarity.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
Notice Advisory to NAVSTAR Users (NANUs) are used to notify users of scheduled and unscheduled satellite outages and general GPS information.	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. This occurs when the satellite meets the conditions for "unhealthy" provided in Section 2.3.2 of the Standard Positioning Service Performance Standard.	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. ~~This occurs when the satellite meets the conditions for "unhealthy" provided in Section 2.3.2 of the Standard Positioning Service Performance Standard.~~ Suggested wording: rejected ~~Operators determine satellite meets the conditions for "unhealthy" provided in Section 2.3.2 of the Standard Positioning Service Performance guide.~~

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-36
Paragraph	3.1.1-17	**Comment Number**	RTN_02, Aero_3
Comment Type	Critical	**Disposition**	Accept with Comments
Comment Originator(s)	Walid Al-Masyabi (Raytheon), Rhonda Slattery (Aerospace)		
Comment	The RFC title and intent is to add Satellite Outage File (SOF) content to as part of the GPS advisory.		
Directorate Response	Contractor and SE&I to derive new wording. Needs to describe new terminology and transition plan from legacy SOF format to Next Generation Operational Control System (OCX) format. (See RTN-New11 for updated wording)		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
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.	*(not in PIRN)*	There are two types of the GPS Advisory exchange information product: 1) A GPS Advisory exchange that includes a single advisory notification concerning a GPS space event and associated GPS space vehicle. 2) A GPS Advisory exchange includes Collection a collection of advisory notifications of all available historical, current and predicted satellite outage space events. See GPS Advisory IEPD for more details. Published on a periodic basis, based on operational events/needs.

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870 General
Paragraph	N/A	**Comment Number**	Aero_2
Comment Type	Critical	**Disposition**	Accept with Comments
Comment Originator(s)	Rhonda Slattery (Aerospace)		
Comment	This is very difficult to review because the Dynamic Object Oriented Requirements System (DOORS) IDs are not in the published document. For public review, additional information is needed or the changes need to be placed in context. Also, you are deleting objects, like Table 3-III, and replacing them with a new DOORs ID as separate actions, making it almost impossible to understand what the final document is going to look like		
Directorate Response	SE&I to work with Rhonda to ensure that the public documents are updated in a way that is less confusing for the public reviewers. Not sure if that will be proposed interface revision notice (PIRNs) with paragraph numbers as well as object IDs or draft documents with object IDs distributed on the .gov web site.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870 General
Paragraph	N/A	**Comment Number**	GPGX-08
Comment Type	Critical	**Disposition**	Accept with Comments
Comment Originator(s)	Stephan Hillman (Aerospace)		
Comment	This proposed interface revision notice (PIRN) removes all shall statements/requirements from this ICD. Has SE&I conducted a review to ensure that these requirements have been properly migrated to another ICD?		
Directorate Response	SE&I has the action to insure requirements are covered in a more appropriate ICD.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-673
Paragraph	3.1.1-12	**Comment Number**	RTN-NEW01
Comment Type	Critical	**Disposition**	Accept
Comment Originator(s)	Walid Al-Masyabi (Raytheon)		
Comment	Need to add a requirement for the Validate and Transform utility to validate the National Information Exchange Model (NIEM) Information Exchange Package Documentation (IEPD) associated with the information product prior to creating backward compatible products formats as described in the appendices of ICD 870.		
Directorate Response	None.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
Using the Information Products and provided Transformation Products as shown in Table 3-III, the Validate and Transform Utility shall allow the user to validate the digital signature of GPS Products.	*(not in PIRN)*	~~Using the Information Products and provided Transformation Products as shown in Table 3-III, the Validate and Transform Utility shall allow the user to validate the digital signature of GPS Products.~~ The Validate and Transform Utility will allow the user to validate the digital signature of GPS Information Products. and its associated NIEM IEPD.

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-698
Paragraph	N/A	**Comment Number**	RTN-NEW02
Comment Type	Critical	**Disposition**	Accept
Comment Originator(s)	Walid Al-Masyabi (Raytheon)		
Comment	Need to add a requirement for the Validate and Transform utility to validate the NIEM IEPD associated with the information product prior to creating backward compatible products formats as described in the appendices of ICD 870.		
Directorate Response	None.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
As the Authoritative Source for GPS 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 CS publishes Transformation Products and also provides a downloadable Validate and Transform Utility to assist users with first validating then transforming 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 CS before doing so to understand the tradeoffs and verify duplicative efforts are not being planned by the GPS CS. ***See following charts for enlarged view**		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 ~~CS publishes Transformation Products and also provides~~ 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 ~~CS~~Community before doing so to understand the tradeoffs and verify duplicative efforts are not being planned by the GPS ~~CS~~Community. ***See following charts for enlarged view**

BASELINE TEXT (WAS) ICD870-698

As the Authoritative Source for GPS 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 CS publishes Transformation Products and also provides a downloadable Validate and Transform Utility to assist users with first validating then transforming 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 CS before doing so to understand the tradeoffs and verify duplicative efforts are not being planned by the GPS CS.

Proposed Text for ICD870-698

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 ~~CS publishes Transformation Products and also provides~~ 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.

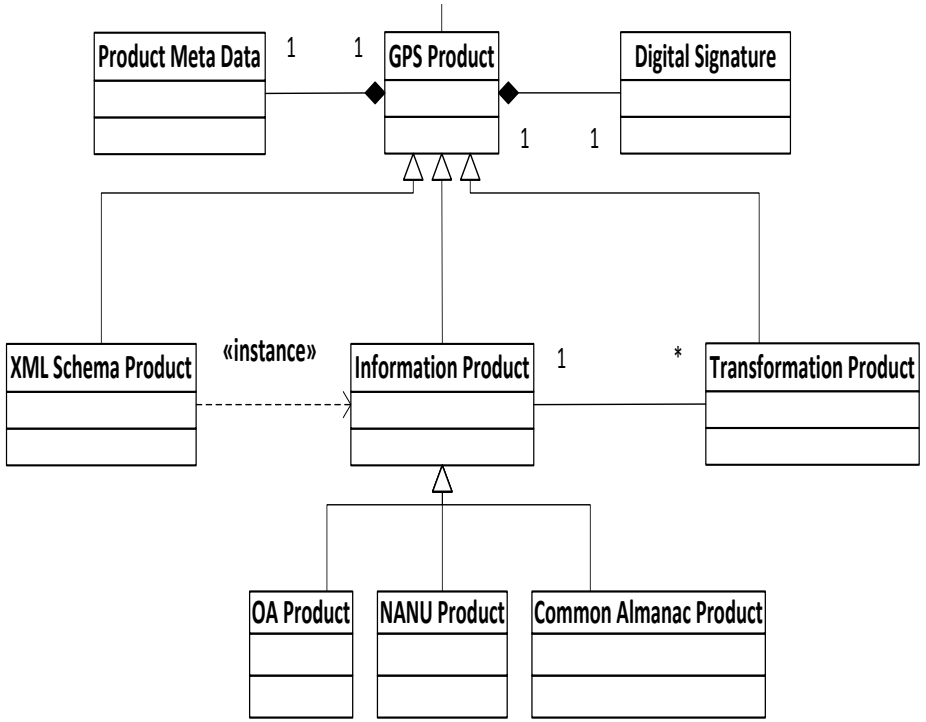
c) In order to maximize the benefit of information assurance, the CS recommends that End Users perform the transformation step as late as possible (just prior to ingesting).

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.

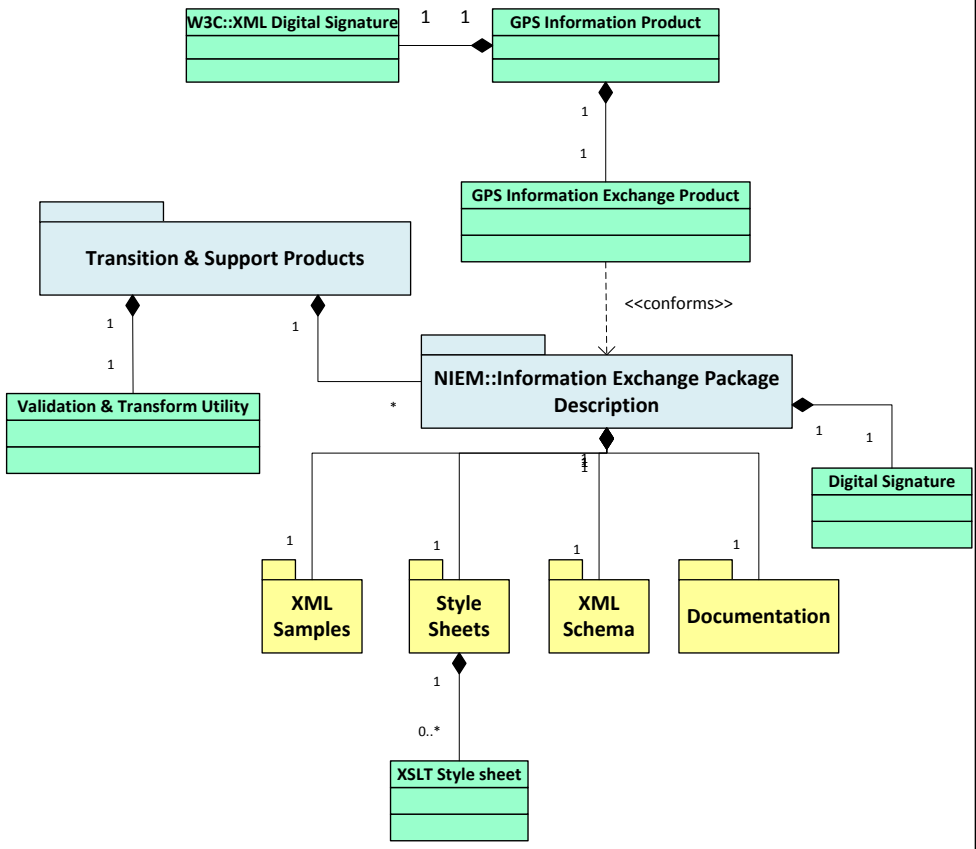
e) Any US government user interested in redistributing GPS Products or products derived from GPS Products are advised to consult with the GPS ~~CS~~Community before doing so to understand the tradeoffs and verify duplicative efforts are not being planned by the GPS ~~CS~~Community.

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-664
Paragraph	3.1.0-10	**Comment Number**	RTN-NEW04
Comment Type	Critical	**Disposition**	Accept
Comment Originator(s)	Walid Al-Masyabi (Raytheon)		
Comment	Need to update figure to include validation of NIEM IEPD		
Directorate Response	None.		

BASELINE TEXT (WAS)



PIRN TEXT (IS)



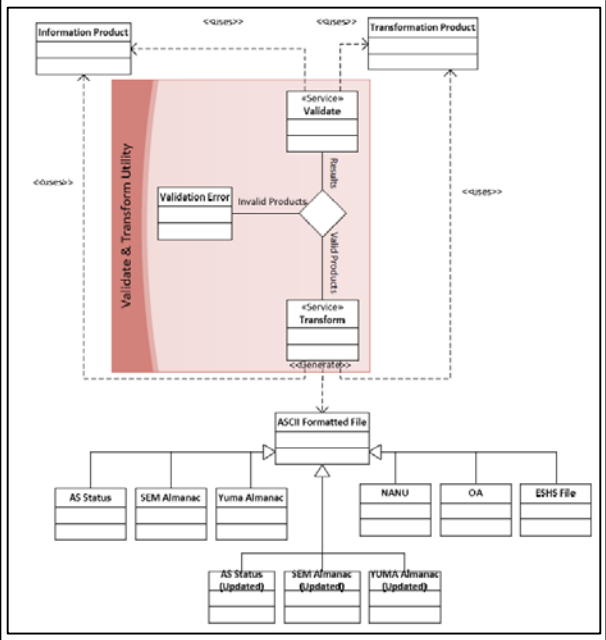
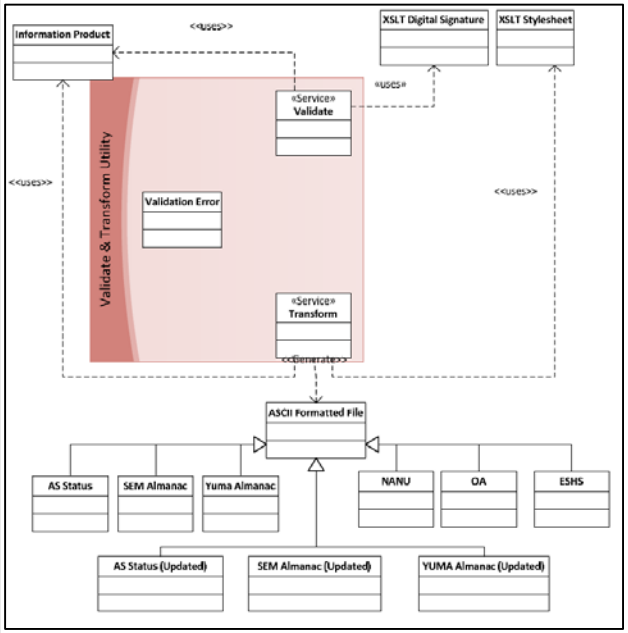
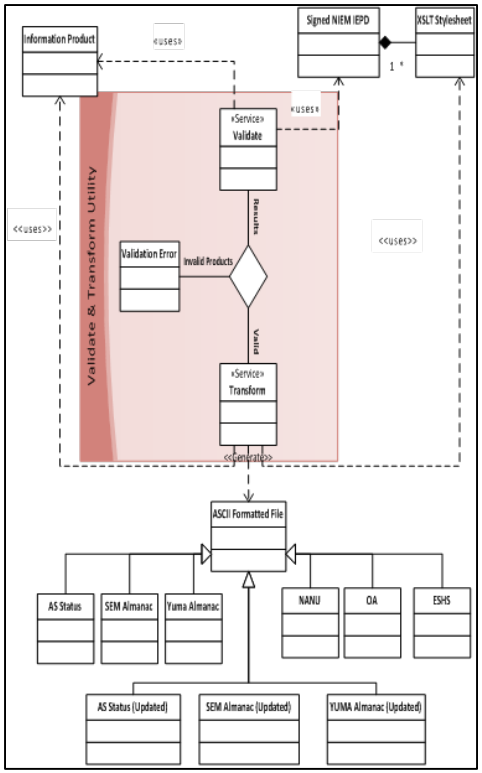
Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-701
Paragraph	3.3.0-6	**Comment Number**	RTN-NEW06
Comment Type	Critical	**Disposition**	Accept
Comment Originator(s)	Walid Al-Masyabi (Raytheon)		
Comment	Need to update to include validation of signed IEPD containing the stylesheet		
Directorate Response	None.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
1. Download the desired Information Product and Transform Product (see Table 3-III). Note: Because the XML schema for an Information Product will change very infrequently, a Transformation Product can be downloaded once for a new schema revision and then reused repeatedly without downloading again. 2. Just prior to use, validate the Digital Signature of Information Product and the Transform Product using a W3C XML Digital Signature Compliant standard COTS/Library (e.g., JDK 1.6/1.7) and the currently published CS public certificate. 3. If the signatures do not validate in Step 2, then either the Information Product or the Transformation Product 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 extract XSLT from the Product Meta Data Body Element (see Figure 3-3) and apply the XSLT using standard COTS/Library to produce the desired ASCII file format.	1. Download the desired Information Product and ~~Transform~~associated ~~Product~~IEPD (see Table 3-III) from USCG NIS web site or an alternate redistribution site. Note: Because the ~~XML schema~~IEPD for an Information Product will change very infrequently, ~~a Transformation~~this ~~Product~~step ~~can~~could be ~~downloaded~~performed once for a new ~~schema~~IEPD revision and then reused repeatedly without downloading again. 2. Just prior to use, validate the Digital Signature of the Information Product and the ~~Transform~~ XSLT ~~Product~~stylesheet signature file using a W3C XML Digital Signature Standard compliant standard COTS/Library ~~(e.g., JDK 1.6/1.7)~~ and the currently published CS public certificate. 3. If the signatures do not validate in Step 2, then either the Information Product or the ~~Transform~~ XSLT ~~Product~~stylesheet 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 ~~extract XSLT from the Product Meta Data Body Element (see Figure 3-3) and~~ apply the XSLT stylesheet using standard COTS/Library to produce the desired ASCII file format.	1. Download the desired Information Product and associated IEPD (see Table 3-III) from USCG NIS web site 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 ~~signature file~~ using a W3C XML Digital Signature Standard 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.

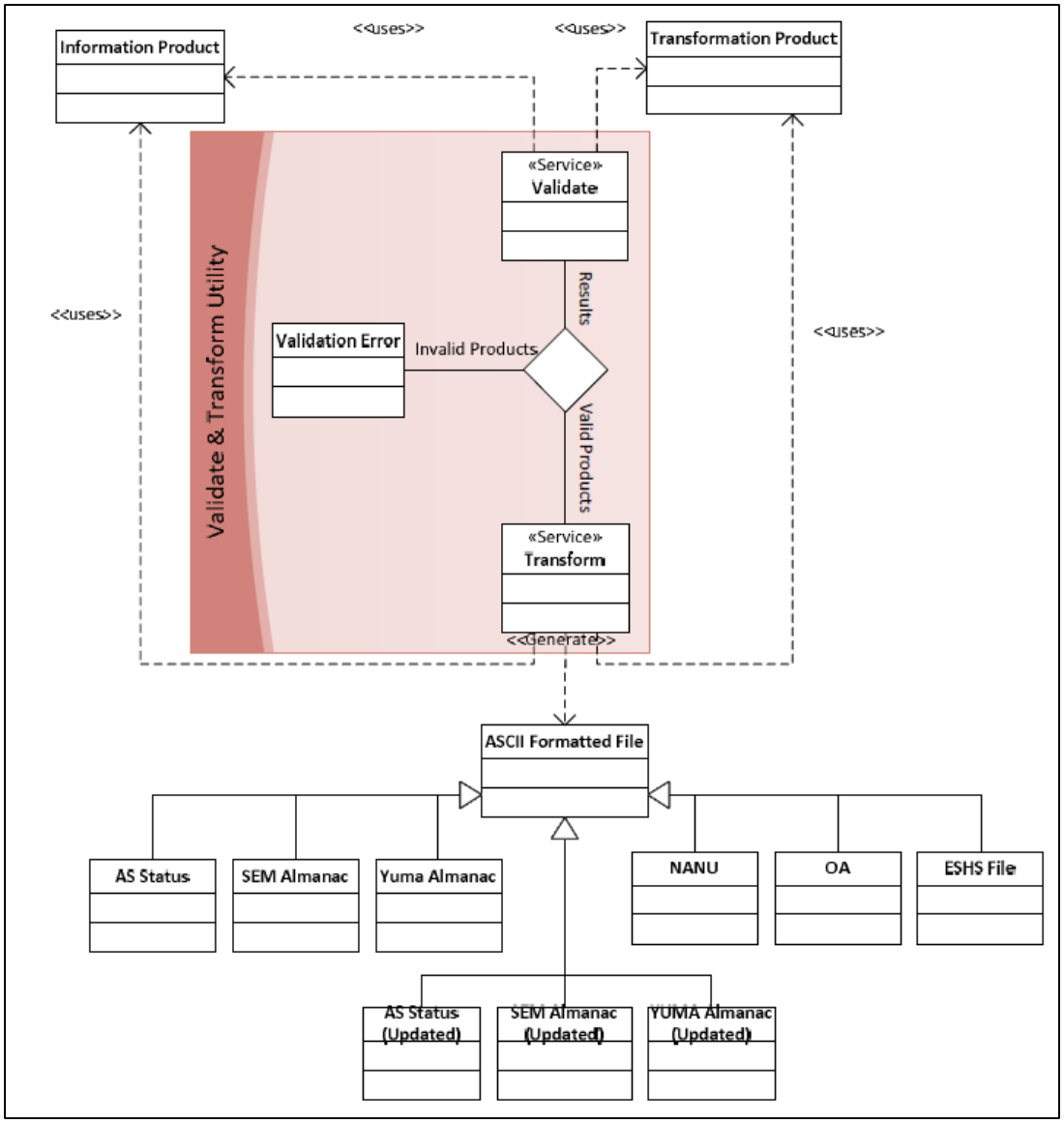
Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-702
Paragraph	3.3.0-7	**Comment Number**	RTN-NEW07
Comment Type	Critical	**Disposition**	Accept w/ Comments
Comment Originator(s)	Walid Al-Masyabi (Raytheon)		
Comment	Need to update to include validation of signed IEPD containing the stylesheet		
Directorate Response	Table reference should remain 3-III		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
1. Download the desired Information Product (see Table 3-III) 2. Just prior to use, Validate the Digital Signature of Information Product using a W3C XML Digital Signature Compliant standard COTS/Library (e.g. JDK 1.6/1.7) 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 Product is authentic and the content has not been corrupted.	1. Download the desired Information Product (see Table 3-~~II~~I) from the USCG NIS web site. 2. Just prior to use, Validate the Digital Signature of Information Product using a W3C XML Digital Signature Compliant standard COTS/Library ~~(e.g. JDK 1.6/1.7)~~ 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.	1. Download the desired Information Product (see Table 3-III) from the USCG NIS web site. 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.

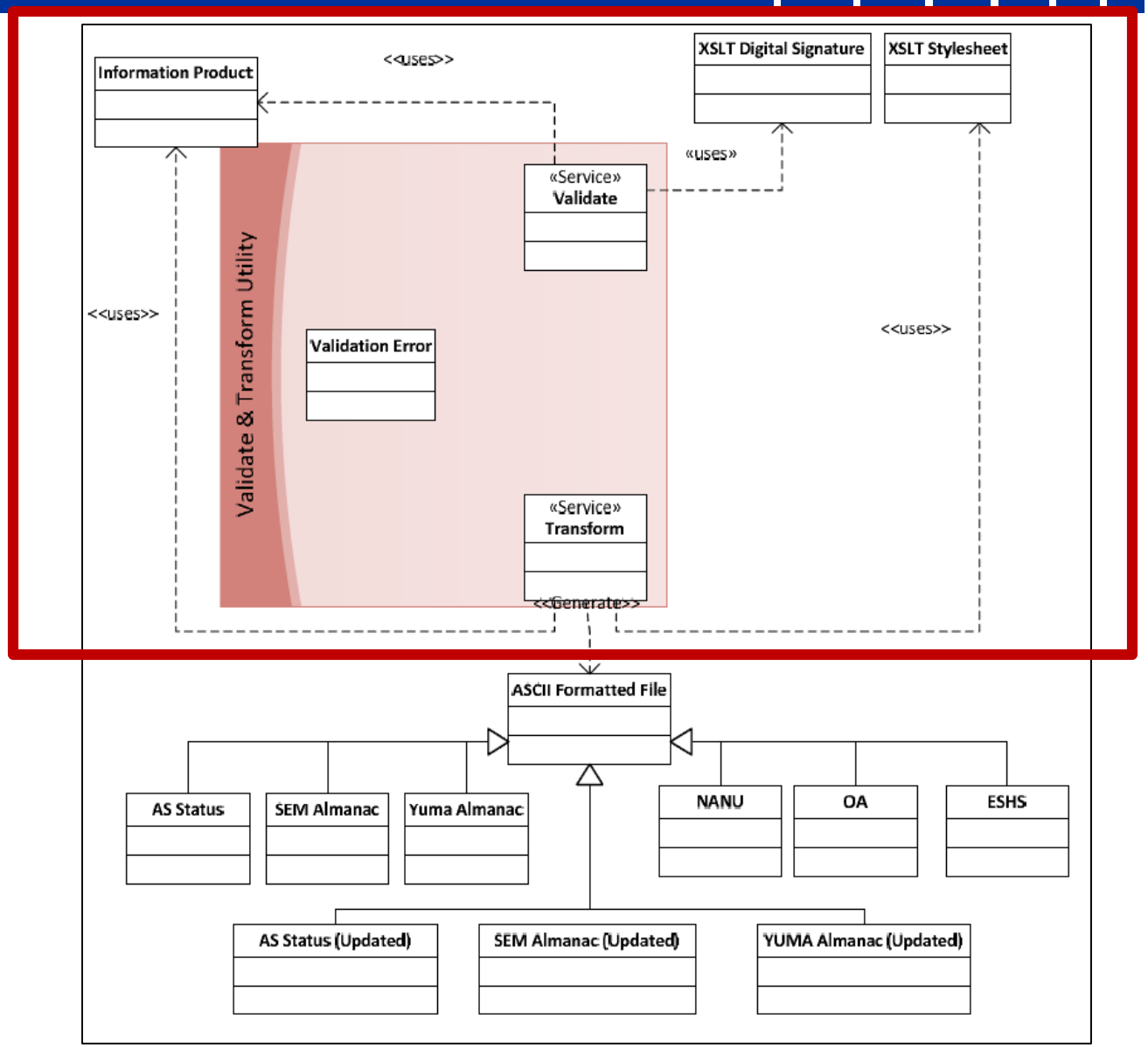
Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-669
Paragraph	3.1.1-7	**Comment Number**	RTN-NEW09
Comment Type	Critical	**Disposition**	Accept
Comment Originator(s)	Walid Al-Masyabi (Raytheon)		
Comment	Need to update figure to include validation of NIEM IEPD		
Directorate Response	None		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
		

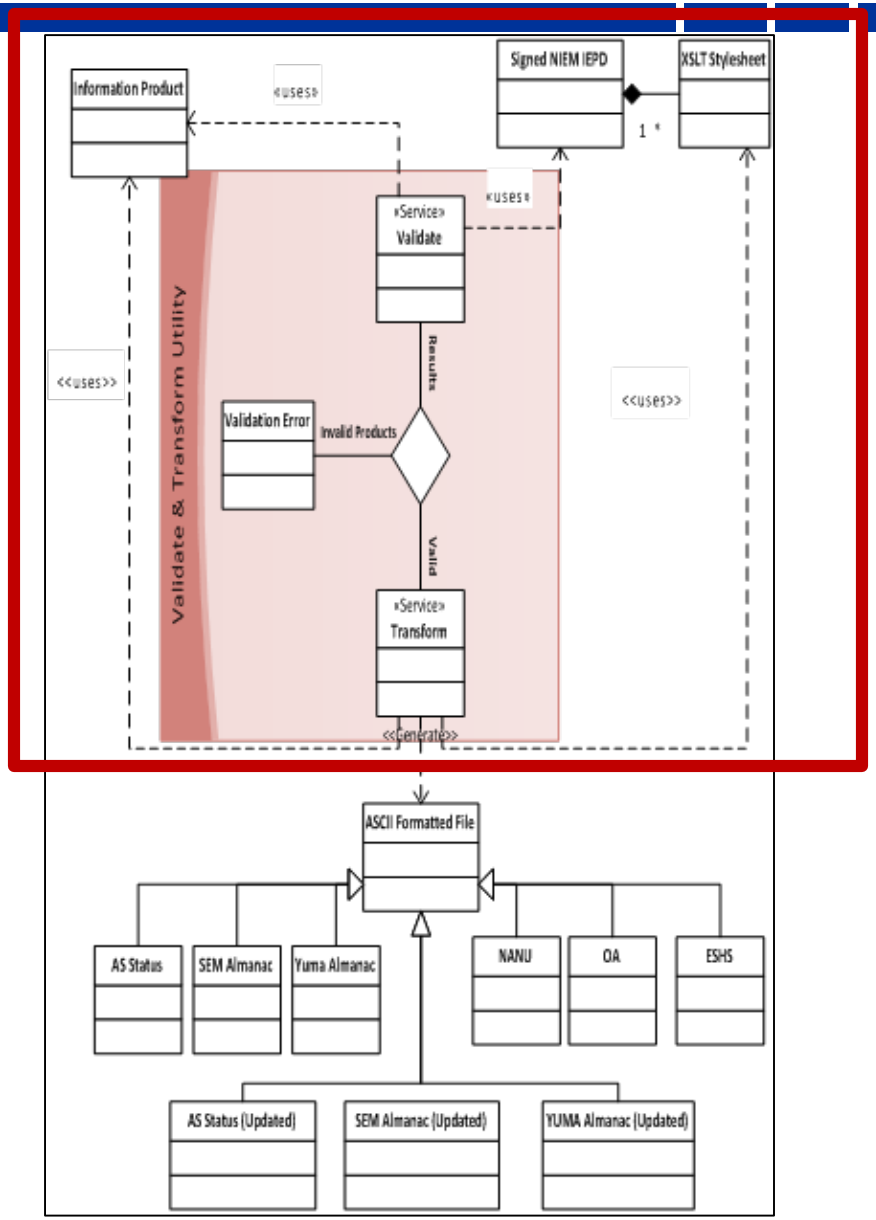
Baseline Text (WAS) ICD870-669



PIRN Text (IS) ICD870-669



Proposed Text ICD870-669



Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-new object
Paragraph	Insert after 3.2.3	**Comment Number**	RTN-NEW10
Comment Type	Critical	**Disposition**	Accept
Comment Originator(s)	Walid Al-Masyabi (Raytheon)		
Comment	Add SOF Production rules		
Directorate Response	None.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	A new SOF will be provided each time one of the following NANU types is issued: FCSTDV, FCSTMX, FCSTEXTD, FCSTSUMM, FCSTCANC, FCSTRESCD, FCSTUUFN, UNUSUFN, UNUSABLE, UNUNOREF, LAUNCH, USABINIT, or DECOM

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-723
Paragraph	3.1.1-18.1	**Comment Number**	RTN-NEW12
Comment Type	Critical	**Disposition**	Accept
Comment Originator(s)	Walid Al-Masyabi (Raytheon)		
Comment	Add legacy SOF backward compatibility to GPS-ICD-870 to be consistent with GPS-ICD-240 addition of SOF.		
Directorate Response	Add appendix (notionally Appendix 2) to show legacy SOF format. This table then points to that appendix for the SOF format.		

BASELINE TEXT (WAS)	**PIRN TEXT (IS)**
Add shown row to table 3-III	

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·bases·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·2·Operational·SOF·Data·Format¤

Affected Document(s)	ICD-GPS-240	**DOORS ID**	ICD240-292 (new object after ICD240-290)
Paragraph	New appendix for SOF	**Comment Number**	GPL_1
Comment Type	Critical	**Disposition**	Accept with Comments
Comment Originator(s)	William Connor (GPL)		
Comment	There is an impact to AEP depending on what is meant by the statements asking to place the SOF file onto the 2 SOPS and USCG NAVCEN websites. If the desire is to have GPS User Support System (GUSS) "in the loop" like it is in providing Almanac files to the websites (someone takes a file from the Almanac PC and places it on GUSS, GUSS then puts on NIPRNET), then there is an impact. If the desire is for 2 SOPS to manually obtain the SOF and put it on the various websites themselves, then no impact to AEP.		
Directorate Response	Need to resolve the final wording. Also, need to determine if there is, in fact, a need to update the GUSS tool (seems likely) to transfer the SOF to the USCG server. Regardless, include the SOF in 240 since it has been declassified. May need another update of 240 to describe how it is actually transferred to the USCG.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	The Satellite Outage File (SOF) is built by the GPSOC GPSIS to provide a complete and up-to-date statement of past, current, and forecasted satellite outages in the GPS constellation. The information contained in the SOF is based solely on NANUs supplied by the 2 SOPS. It only applies to the GPS satellites managed by the US Air Force, and thus does not reflect status of augmentation satellites, such as those in the WAAS and EGNOS constellations. SOF data is updated and posted to GPSOC GPSIS web sites whenever the GPSOC issues a Notice: Advisory to Navstar Users (NANU).	*To be determined*

Affected Document(s)	ICD-GPS-240	**DOORS ID**	ICD240-102, ICD870-111
Paragraph	10.1.2.0-3	**Comment Number**	KK-2, KK-3, GPL_2
Comment Type	Critical	**Disposition**	Defer
Comment Originator(s)	Karl Kovach (GPE)		
Comment	Add SOF Production rules		
Directorate Response	Not clear when these new types would be used. 2SOPS will have to weigh in on impact to implement. Added as a 2016 Public Forum Special Topic.		

PIRN TEXT (IS)	**PROPOSED TEXT**
N/A	

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 NANU	Gives times for outages that were resolved before an UNUSUFN NANU could be sent.
UNUSIFUFN	Unusable Integrity Failure Until Further Notice	Notifies users that a satellite will be unusable due to an integrity failure to all users until further notice.
UNUSIFABLE	Unusable Integrity Failure with reference NANU	Closes out an UNUSIFUFN NANU and gives the exact outage (malfunction) times; references the UNUSIFUFN NANU.
UNUIFNOREF	Unusable Integrity Failure with no reference NANU	Gives times for outages (malfunctions) that were resolved before an UNUSIFUFN NANU could be sent.

RFC-308
Update ICDs 240 and 870

Critical Comments

Substantive Comments (19)

Rejected Administrative Comments

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-36
Paragraph	3.1.1-17	**Comment Number**	RTN_NEW11
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Walid Al-Masyabi (Raytheon)		
Comment	Updated wording for object		
Directorate Response	Column 2 of the new table format should show both the modern and the legacy names.		

BASELINE TEXT (WAS)

Producer	Data Exchange Identification	Information Description	Security
GPS CS	GPS Status Information	Information Product: NANU (see Table 3-III)	**Unclassified Public Releasable Open Access**
GPS CS	GPS Constellation Status Summary	Information Product: OA (See Table 3-III)	**Unclassified Public Releasable Open Access**
GPS CS	**GPS Constellation Orbital and Performance Parameters, and SV Signal Health Status** **GPS Constellation Anti-Spoofing Status**	**Information Product: Common Almanac (See Table 3-III)**	**Unclassified Public Releasable Open Access**

PIRN TEXT (IS)

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: 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

PROPOSED TEXT

N/A

BASELINE TEXT (WAS) ICD870-36

Producer	Data Exchange Identification	Information Description	Security
GPS CS	GPS Status Information	Information Product: NANU (see Table 3-III)	**Unclassified Public Releasable Open Access**
GPS CS	GPS Constellation Status Summary	Information Product: OA (See Table 3-III)	**Unclassified Public Releasable Open Access**
GPS CS	**GPS Constellation Orbital and Performance Parameters, and SV Signal Health Status** **GPS Constellation Anti-Spoofing Status**	**Information Product: Common Almanac (See Table 3-III)**	**Unclassified Public Releasable Open Access**

PIRN TEXT (IS) ICD870-36

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: 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

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-662
Paragraph	3.1.0-8	**Comment Number**	Aero_1
Comment Type	Substantive	**Disposition**	Reject
Comment Originator(s)	Rhonda Slattery (Aerospace)		
Comment	Why are you deleting "offered by the CS" This vocabulary does not apply to all GPS public products. If you are making a distinction between the CS and USCG, how about replacing with "discussed in this ICD"		
Directorate Response	Reviewer accepted rationale provided by author of the original change.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
In accordance with DODD 8320, Data Sharing in a Net Centric Department of Defense, this ICD defines and then uses a GPS domain specific information exchange vocabulary which users should adopt when discussing the public GPS products offered by the CS. Figure 3-3 depicts a high level entity relationship diagram summarizing the GPS Product Ontology.	~~In accordance with DODD 8320, Data Sharing in a Net Centric Department of Defense, this~~This ICD defines and then uses a GPS domain specific information exchange vocabulary which users should adopt when discussing the public GPS products ~~offered by the CS~~. 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).	N/A

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-679
Paragraph	3.1.1-20	**Comment Number**	Aero_2
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	Rhonda Slattery (Aerospace)		
Comment	This is deleting the header of Table 3-iii, but the actual table from the approved document doesn't seem to be deleted, but it was replaced with a new 723, leaving two table 3-iii's		
Directorate Response	Correct. Old Table 3-III should have been deleted.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
Table 3-III Mapping Information Products & Transformation Products into Desired Output Format CS Effectivity: N/A SS Effectivity: N/A	~~Table 3-III Mapping Information Products & Transformation Products into Desired Output Format~~ ~~CS Effectivity: N/A~~ ~~SS Effectivity: N/A~~	<DELETED OBJECT>

Affected Document(s)	ICD-GPS-870	**DOORS ID**	ICD870-141
Paragraph	10.2.0-3	**Comment Number**	Aero_6
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Rhonda Slattery (Aerospace)		
Comment	Why was the 15 min objective removed? It adds no additional burden to OCX to have a goal that's better than their requirement.		
Directorate Response	15 minutes is arbitrary. If an objective is provided, it should now include separate allocations for processing time and operator time to declassify the data.		

BASELINE TEXT (WAS)

NANU Group	Nominal Notification Times	Objective
Scheduled	48 hrs prior to outage start	96 hrs prior to outage start
Unscheduled	Less than 1 hr after outage start	15 minutes after outage start
General	No Nominal – Timing determined on a case-by-case basis	
Other	No Nominal – Timing determined on a case-by-case basis	

PIRN TEXT (IS)

NANU Group	Nominal Notification Times	Objective
Scheduled	48 hrs prior to outage start	96 hrs prior to outage start
Unscheduled	Less than 1 hr after outage start	~~15 minutes after outage start~~
General	No Nominal – Timing determined on a case-by-case basis	
Other	No Nominal – Timing determined on a case-by-case basis	

Affected Document(s)	ICD-GPS-240; ICD-GPS-870	**DOORS ID**	ICD240 and ICD870 Table 3-I
Paragraph	3.1.1.1-17	**Comment Number**	KK-1
Comment Type	Substantive	**Disposition**	Defer
Comment Originator(s)	Karl Kovach (GPE)		
Comment	Add description for Receiver Independent Exchange Format (RINEX) for nav data interchange		
Directorate Response	Added as a 2016 PICWG Special Topic.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	ICD-GPS-240; ICD-GPS-870	**DOORS ID**	ICD240 and ICD870
Paragraph	new	**Comment Number**	KK-4,5
Comment Type	Substantive	**Disposition**	Defer
Comment Originator(s)	Karl Kovach (GPE)		
Comment	Add description of Predict Ephemeris/State Vector Data		
Directorate Response	Added as a 2016 PICWG Special Topic.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	ICD-GPS-240	**DOORS ID**	ICD240-294
Paragraph	21.1	**Comment Number**	TEDD_1
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	Ted Driver (Advanced Research Corp)		
Comment	At the top of page 12 of PIRN-240A-002, there is a statement that all times are GPS TIME unless otherwise specified. In the definitions for satellite outages, there is no other specification for time standards, so one must assume that the outage times in the SOF are GPS TIME. This is incorrect. Outage times in the SOF are identical to the outage times in the NANUS. NANU outages times are ZULU (UTC), defined by ICD-GPS-240A, paragraph 10.3.2.4.		
Directorate Response	*This comment is in the new wording describing the SOF message format and is several pages long. Text came from another GPS design document. SE&I will take an action to verify the time source for the SOF message. One alternative is to add information to each outage section description that the outage times are in UTC.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	All times are GPS TIME unless otherwise specified.	All times are ~~GPS TIME~~ UTC unless otherwise specified.

Affected Document(s)	ICD-GPS-240	**DOORS ID**	ICD240-294
Paragraph	21.1	**Comment Number**	TEDD_2
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Ted Driver (Advanced Research Corp)		
Comment	At the bottom of page 13 of PIRN-240A-002, "Changes to the file formats are implemented as follows:" bullet number 3: "The old file format will be posted for four months, and then be removed. ...". We'd like to request this be extended to 6 months to accommodate commercial development cycles.		
Directorate Response	Need concurrence from 2SOPS that this is acceptable. *This comment is in the new wording describing the SOF message format and is several pages long.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	3. The old file format will be posted for four months, and then be removed.	3. The old file format will be posted for ~~four~~six months, and then be removed.

Affected Document(s)	ICD-GPS-240	**DOORS ID**	ICD240-294
Paragraph	21.1	**Comment Number**	TEDD_3
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Ted Driver (Advanced Research Corp)		
Comment	At the bottom of page 13 of PIRN-240A-002, "Changes to the file formats are implemented as follows:" add a bullet 4: Notifications of file format changes, with samples of the new format, will be published to www.GPS.gov when they are final.		
Directorate Response	This seems quite reasonable, just not sure who would be responsible for making the notification and how. Updating ICD-GPS-240 by itself can take a year.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	3. The old file format will be posted for four months, and then be removed.	3. The old file format will be posted for four months, and then be removed. 4. Notifications of file format changes, with samples of the new format, will be published to www.GPS.gov when they are final.

DEFINITION CLARIFICATION FOR TIME OF PREDICT

J. Ji
J. Buckley

RFC-312
Definition Clarification for Time of Predict

Problem Statement:
To remove ambiguity in contractor interpretation, the definition of the parameter Time of Predict (T_op) and other timing parameters must be clarified in the GPS technical baseline documentation.
Proposed Solution:
Process RFC via the proposed changes with the correct stakeholders and update the appropriate documentation for accurate implementation.
Impacted Documents:
(IS-GPS-200 Rev H, IS-GPS-705 Rev D, and IS-GPS-800 Rev D)

RFC-312 CRM Status

CRM – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS					
Disposition/Type	**Critical**	**Substantial**	**Administrative**	**Totals**	**Concurrence**
Accept	0	0	54	54	0
Accept with Comment	1	20	2	23	5
Reject	0	1	0	1	0
Defer	4	0	0	4	0
Grand Totals:	5	21	56	82	0

RFC-312
Definition Clarification for Time of Predict

Critical Comments (5)

Substantive Comments

Rejected Administrative Comments

Affected Document(s)	IS-GPS-200; IS-GPS-705; IS-GPS-800	**DOORS ID**	IS200-1515; IS705-1517; IS800-914
Paragraph	200-6.2.10; 705-6.2.9; 800-6.2.9	**Comment Number**	18
Comment Type	Critical	**Disposition**	Accept w/ Comment
Comment Originator(s)	Rhonda Slattery (Aerospace)		
Comment	This seems to introduce OCX to IS-GPS-200 for the first time. If this is required, additional discussion about the various Blocks of CSs is needed in section 6. Other additional discussion about the use of CS/OCX/??? May be needed also.		
Directorate Response	References to OCX will be removed. After discussion involving Aerospace, acronym was updated to be "Clock/Ephemeris/Integrity (CEI)". Aerospace subject matter experts concur that the verbiage "multiple segments of temporally continuous" would be more appropriate along with using term CEI rather than ICE.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	A related time-ordered sequence of ICE data sets in which each successive ICE data set is a time projection of the preceding ICE data set. Special provisions apply to alert users to discontinuities separating one ICE data projection sequence from another ICE data projection sequence (e.g., after an upload occurs). Before modernization, an ICE data projection sequence was sometimes called an "uploaded sequence of Subframe 1-2-3 data sets". Beginning with the Next Generation Operational Control System (OCX), an upload may include multiple, disjoint but contiguous ICE data projection sequences.	A related time-ordered sequence of ~~ICE~~CEI data sets in which each successive ~~ICE~~CEI data set is a time projection of the preceding ~~ICE~~CEI data set. Special provisions apply to alert users to discontinuities separating one ~~ICE~~CEI data projection sequence from another ~~ICE~~CEI data projection sequence (e.g., after an upload occurs). Before modernization, in LNAV terms, a~~n~~ ~~ICE~~CEI data projection sequence was sometimes called an "uploaded sequence of Subframe 1-2-3 data sets". ~~Beginning with the Next Generation Operational Control System (OCX),~~ An upload may include multiple segments of temporally continuous ~~disjoint but contiguous ICE~~CEI data projection sequences.

Affected Document(s)	IS-GPS-200; IS-GPS-705; IS-GPS-800	**DOORS ID**	IS200-363; IS200-550, IS705-239, IS800-179
Paragraph	200-20.3.3.4.2; 200-30.3.3.1.3; 705-20.3.3.1.3; 800-3.5.3.6.1	**Comment Number**	47, 58, 76
Comment Type	Critical	**Disposition**	Defer to PICWG
Comment Originator(s)	Mike Carroll (Raytheon)		
Comment	Using "projected ephemeris" instead of "predicted ephemeris" does not clarify the terminology, since "projected" has connotations other than temporal. E.g., it connote the projection of one vector onto another. Recommend leaving original text as is. Reverting to predicted nomenclature would render void many of the proposed changes.		
Directorate Response	Further discussion on this topic is needed. Prediction occurs once on the ground and then is uploaded as “n” projections.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
The user shall compute the ECEF coordinates of position for the phase center of the SVs’ antennas utilizing a variation of the equations shown in Table 20-IV. Subframes 2 and 3 parameters are Keplerian in appearance; the values of these parameters, however, are produced by the CS (Block II/Block IIA/IIR/IIR-M/IIF) and SS (GPS III) via a least squares curve fit of the predicted ephemeris of the phase center of the SVs’ antennas (time-position quadruples; t, x, y, z expressed in ECEF coordinates). Particulars concerning the periods of the curve fit, the resultant accuracy, and the applicable coordinate system are given in the following subparagraphs.	The user shall compute the ECEF coordinates of position for the phase center of the SVs’ antennas utilizing a variation of the equations shown in Table 20-IV. Subframes 2 and 3 parameters are Keplerian in appearance; the values of these parameters, however, are produced by the CS (Block II/Block IIA/IIR/IIR-M/IIF) and SS (GPS III) via a least squares curve fit of the ~~predicted~~ projected ephemeris of the phase center of the SVs’ antennas (time-position quadruples; t, x, y, z expressed in ECEF coordinates). Particulars concerning the periods of the curve fit, the resultant accuracy, and the applicable coordinate system are given in the following subparagraphs.	N/A

Affected Document(s)	IS-GPS-200; IS-GPS-705; IS-GPS-800	**DOORS ID**	IS200-1513, IS705-1515, IS800-912
Paragraph	200-6.2.9.1; 705-6.2.8.1; 800-6.2.8.1	**Comment Number**	28
Comment Type	Critical	**Disposition**	Defer to PICWG
Comment Originator(s)	Steven Brown (Lockheed Martin)		
Comment	Remove "health flags" as an example of a related parameter within an ICE data set because health flags can change independent of ephemeris and clock values. Recommend providing an explicit list of the exact parameters that constitute the ICE data set to remove any ambiguity. It should be the collection of parameters within SF123 that get projected in time based on the propagation of the state vector. Consider further re-writes to explicitly list the parameters that are considered to be the ICE data set.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	An Integrity/Clock/Ephemeris (ICE) data set is the collection of SV-specific URA parameters, clock correction polynomial parameters, ephemeris parameters, and related parameters (health flags, time tags, etc.) needed to use the SV's broadcast signal(s) in the positioning service. ICE data is sometimes also known as the user's 'hot start' data for the SV. Before modernization, an ICE data set was sometimes called a "Subframe 1-2-3 data set".	A~~n Integrity/Clock/Ephemeris (ICE)~~ Clock/Ephemeris/Integrity (CEI) data set is the collection of ~~SV-specific URA parameters, clock correction polynomial parameters, ephemeris parameters, and related parameters (health flags, time tags, etc.)~~ data fields for SV health, SV clock correction coefficients, reference time tags, a set of quasi-Keplerian ephemeris elements, accuracy indicators for clock-related data, a set of gravitational harmonic correction terms, rates and rate corrections to quasi-Keplerian elements, an accuracy indicator for ephemeris-related data, and correction terms [and associated figures of accuracy] that compensate for inter-signal bias resulting from SV group delay differential, that are needed to use the SV's broadcast signal(s) in the positioning service. ~~ICE~~CEI data is sometimes also known as the user's 'hot start' data for the SV. Before modernization, in LNAV terms, a~~n ICE~~CEI data set was sometimes called a "Subframe 1-2-3 data set".

RFC-312
Definition Clarification for Time of Predict

Critical Comments

Substantive Comments (21)

Rejected Administrative Comments

Affected Document(s)	IS-GPS-200; IS-GPS-705; IS-GPS-800	**DOORS ID**	*Applies to all CEI updates*
Paragraph	Applies to all CEI updates	**Comment Number**	6
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Rhonda Slattery (Aerospace)		
Comment	ICE has been a standard definition for Improved Clock and Ephemeris, and part of the M-code Improved Clock and Ephemeris (MICE) definitions for over 10 years (since 2004 in IS-GPS-200, 2003 for 705). Changing it now will cause years of briefings, papers, and other documentation to be confusing and misinterpreted. Come up with another acronym		
Directorate Response	After discussion involving Aerospace, acronym was updated to be “Clock/Ephemeris/Integrity (CEI)”		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	Integrity/Clock/Ephemeris (ICE)	~~Integrity/Clock/Ephemeris (ICE)~~ Clock/Ephemeris/Integrity (CEI)

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-468
Paragraph	200-20.3.4.4 Table 20-XII	**Comment Number**	29
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Steven Brown (Lockheed Martin)		
Comment	Note 5 (at a minimum) needs to be updated to refer to ICE data projection sequence. Perhaps also Note 2's "at least the first 14 days after upload"?		
Directorate Response	After discussion involving Aerospace, acronym was updated to be “Clock/Ephemeris/Integrity (CEI)”. Update will be made.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
Note 2: IODC values for blocks with 1-, 2- or 4-hour transmission intervals (at least the first 14 days after upload) shall be any numbers in the range 0 to 1023 excluding those values of IODC that correspond to IODE values in the range 240-255, subject to the constraints on re-transmission given in paragraph 20.3.4.4. The CS can define the GPS III SV time of transition from the 4 hour curve fits into extended navigation (beyond 4 hour curve fits). Following the transition time, the SV will follow the timeframes defined in the table, including appropriately setting IODC values. …… Note 5: The first data set of a new upload may be cut-in at any time and therefore the transmission interval may be less than the specified value.	N/A	Note 2: IODC values for blocks with 1-, 2- or 4-hour transmission intervals (at least the first 14 days after a new CEI data projection sequence ~~upload~~) shall be any numbers in the range 0 to 1023 excluding those values of IODC that correspond to IODE values in the range 240-255, subject to the constraints on re-transmission given in paragraph 20.3.4.4. The CS can define the GPS III SV time of transition from the 4 hour curve fits into extended navigation (beyond 4 hour curve fits). Following the transition time, the SV will follow the timeframes defined in the table, including appropriately setting IODC values. …… Note 5: The first data set of a new CEI data projection sequence ~~upload~~ may be cut-in at any time and therefore the transmission interval may be less than the specified value.

Affected Document(s)	IS-GPS-800	**DOORS ID**	IS800-167
Paragraph	800-3.5.3.3	**Comment Number**	68
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Steven Brown (Lockheed Martin)		
Comment	Updated object text should specify the new definition of t_{op}.		
Directorate Response	After discussion involving Aerospace, acronym was updated to be “Clock/Ephemeris/Integrity (CEI)”.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
Bits 22 through 32 of subframe 2 shall contain the data predict time of week (t_{op}). The t_{op} term provides the epoch time of week of the state estimate utilized for the prediction of satellite quasi-Keplerian ephemeris parameters.	Bits 22 through 32 of subframe 2 shall contain the data predict time of week (t_{op}). The t_{op} term provides the epoch time of week of the state data ~~estimate~~ utilized for the ~~prediction~~ projection of satellite ICE data quasi-Keplerian ephemeris parameters. Users are cautioned to avoid using this parameter to compute age of data for any SV.	Bits 22 through 32 of subframe 2 shall contain the ~~ICE~~CEI data projection ~~predict~~ sequence time of week (t_{op}). The t_{op} term provides the epoch time of week of the state data utilized for the projection of satellite ~~ICE~~CEI data quasi-Keplerian ephemeris parameters. Users are cautioned to avoid using this parameter to compute age of data for any SV.

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-564
Paragraph	200-30.3.3.2.1.2	**Comment Number**	81
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Stephan Hillman (Aerospace)		
Comment	This object should contain the same warning text as in the last sentence of IS200-543.		
Directorate Response	After discussion involving Aerospace, acronym was updated to be “Clock/Ephemeris/Integrity (CEI)”. The object will be updated to contain the same warning text as in the last sentence of object IS200-543.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
Bits 39 through 49 of message types 30 through 37 shall contain the data predict time of week (t_{op}). The t_{op} term provides the epoch time of week of the state estimate utilized for the prediction of SV clock correction coefficients.	Bits 39 through 49 of message types 30 through 37 shall contain the ICE data projection ~~predict~~ time of week (t_{op}). The t_{op} term provides the epoch time of week of the state data ~~estimate~~ utilized for ~~the prediction~~ projecting the SV clock correction coefficients forward in time.	Bits 39 through 49 of message types 30 through 37 shall contain the ~~ICE~~CEI data projection time of week (t_{op}). The t_{op} term provides the epoch time of week of the state data utilized for projecting the SV clock correction coefficients forward in time. Users are cautioned to avoid using this parameter to compute age of data for any SV.

Affected Document(s)	IS-GPS-200; IS-GPS-705; IS-GPS-800	**DOORS ID**	IS200-1515, IS705-1517, IS800-914
Paragraph	200-6.2.10; 705-6.2.9; 800-6.2.9	**Comment Number**	40
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Roger Kirpes (Rockwell Collins)		
Comment	It is not clear what the phrase "multiple disjoint but contiguous" ICE data projection sequences implies for the user of such data. Clarify what is meant by "multiple disjoint but contiguous" ICE data projection sequences. Clarify what effect user equipment (UE) may experience if the broadcast ICE data changes from one data projection sequence to another. For example, clarify if the UE could compute SV positions, for the same time, using data sets which are both valid for that time, but result in SV positions which separated by more than the associated broadcast user range accuracy (URA) value.		
Directorate Response	Aerospace subject matter experts concur that the verbiage “multiple segments of temporally continuous” would be more appropriate along with using term CEI rather than ICE.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	A related time-ordered sequence of ICE data sets in which each successive ICE data set is a time projection of the preceding ICE data set. Special provisions apply to alert users to discontinuities separating one ICE data projection sequence from another ICE data projection sequence (e.g., after an upload occurs). Before modernization, an ICE data projection sequence was sometimes called an “uploaded sequence of Subframe 1-2-3 data sets”. Beginning with the Next Generation Operational Control System (OCX), an upload may include multiple, disjoint but contiguous ICE data projection sequences.	A related time-ordered sequence of ~~ICE~~CEI data sets in which each successive ~~ICE~~CEI data set is a time projection of the preceding ~~ICE~~CEI data set. Special provisions apply to alert users to discontinuities separating one ~~ICE~~CEI data projection sequence from another~~ICE~~ CEI data projection sequence (e.g., after an upload occurs). Before modernization, in LNAV terms, an ~~ICE~~CEI data projection sequence was sometimes called an “uploaded sequence of Subframe 1-2-3 data sets”. ~~Beginning with the Next Generation Operational Control System (OCX),~~ An upload may include multiple segments of temporally continuous ~~disjoint but contiguous ICE~~CEI data projection sequences.

Affected Document(s)	IS-GPS-200; IS-GPS-705; IS-GPS-800	**DOORS ID**	IS200-1513, IS200-1515, IS705-1515, IS705-1517, IS800-912, IS800-914
Paragraph	200-6.2.9 and 200-6.2.10; 705-6.2.8 and 705-6.2.9; 800-6.2.8 and 800-6.2.9	**Comment Number**	4, 65
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Rhonda Slattery (Aerospace) and Steven Brown (Lockheed Martin)		
Comment	Since subframe 1-2-3 data set has never been in any of these documents, introducing it now doesn't help reduce any confusion. Delete the last sentence. Does this explanatory text make sense in a CNAV-2 spec, when "Subframe 1-2-3" refers to the Legacy NAV Subframes 1-3? Subframes mean something different in CNAV-2.		
Directorate Response	After speaking with Aerospace it was determined that the subframe reference was useful when LNAV context was made clear.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	An Integrity/Clock/Ephemeris (ICE) data set is the collection of SV-specific URA parameters, clock correction polynomial parameters, ephemeris parameters, and related parameters (health flags, time tags, etc.) needed to use the SV's broadcast signal(s) in the positioning service. ICE data is sometimes also known as the user's 'hot start' data for the SV. Before modernization, an ICE data set was sometimes called a "Subframe 1-2-3 data set".	An ~~Integrity/Clock/Ephemeris (ICE)~~ Clock/Ephemeris/Integrity (CEI) data set is the collection of SV-specific URA parameters, clock correction polynomial parameters, ephemeris parameters, and related parameters (health flags, time tags, etc.) needed to use the SV's broadcast signal(s) in the positioning service. ~~ICE~~CEI data is sometimes also known as the user's 'hot start' data for the SV. Before modernization, in LNAV terms, a ~~ICE~~CEI data set was sometimes called a "Subframe 1-2-3 data set".
N/A	A related time-ordered sequence of ICE data sets in which each successive ICE data set is a time projection of the preceding ICE data set. Special provisions apply to alert users to discontinuities separating one ICE data projection sequence from another ICE data projection sequence (e.g., after an upload occurs). Before modernization, an ICE data projection sequence was sometimes called an "uploaded sequence of Subframe 1-2-3 data sets". Beginning with the Next Generation Operational Control System (OCX), an upload may include multiple, disjoint but contiguous ICE data projection sequences.	A related time-ordered sequence of ~~ICE~~CEI data sets in which each successive ~~ICE~~CEI data set is a time projection of the preceding ~~ICE~~CEI data set. Special provisions apply to alert users to discontinuities separating one ~~ICE~~CEI data projection sequence from another ~~ICE~~CEI data projection sequence (e.g., after an upload occurs). Before modernization, in LNAV terms, an ~~ICE~~CEI data projection sequence was sometimes called an "uploaded sequence of Subframe 1-2-3 data sets". ~~Beginning with the Next Generation Operational Control System (OCX),~~ An upload may include multiple segments of temporally continuous ~~disjoint but contiguous~~ ~~ICE~~CEI data projection sequences.

Proposed Text

IS-GPS-200 Rev H (IS200-1513, IS200-1515), IS-GPS-705 Rev D (IS705-1515, IS705-1517), IS-GPS-800 Rev D (IS800-912, IS800-914)

An ~~Integrity/Clock/Ephemeris (ICE)~~ Clock/Ephemeris/Integrity (CEI) data set is the collection of SV-specific URA parameters, clock correction polynomial parameters, ephemeris parameters, and related parameters (health flags, time tags, etc.) needed to use the SV's broadcast signal(s) in the positioning service. ~~ICE~~CEI data is sometimes also known as the user's 'hot start' data for the SV. Before modernization, in LNAV terms, a ~~ICE~~CEI data set was sometimes called a "Subframe 1-2-3 data set".

A related time-ordered sequence of ~~ICE~~CEI data sets in which each successive ~~ICE~~CEI data set is a time projection of the preceding ~~ICE~~CEI data set. Special provisions apply to alert users to discontinuities separating one ~~ICE~~CEI data projection sequence from another ~~ICE~~CEI data projection sequence (e.g., after an upload occurs). Before modernization, in LNAV terms, an ~~ICE~~CEI data projection sequence was sometimes called an "uploaded sequence of Subframe 1-2-3 data sets". ~~Beginning with the Next Generation Operational Control System (OCX),~~ An upload may include multiple segments of temporally continuous ~~disjoint but contiguous~~ ~~ICE~~CEI data projection sequences.

Affected Document(s)	IS-GPS-200; IS-GPS-705; IS-GPS-800	**DOORS ID**	*Applies to all $t_{op\text{-}D}$ updates*
Paragraph	Applies to all $t_{op\text{-}D}$ updates	**Comment Number**	8
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Rhonda Slattery (Aerospace)		
Comment	Changing the definition of a variable ($t_{op\text{-}D}$ to $t_{ok\text{-}D}$) for no particular reason is confusing and liable to cause unneeded updates in people's documentation and possibly software. You can change the name e.g., in 200-640 without needing to change the variable.		
Directorate Response	After discussion involving Aerospace, changes to variable reverted and the $t_{op\text{-}D}$ variable will remain as $t_{op\text{-}D}$		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
top-D	tok-D	tokp-D

Affected Document(s)	IS-GPS-200; IS-GPS-705;	**DOORS ID**	IS200-654; IS705-354
Paragraph	200-30.3.3.7.5; 705-20.3.3.7.5	**Comment Number**	51
Comment Type	Substantive	**Disposition**	Reject w/ Comment
Comment Originator(s)	Steven Brown (Lockheed Martin)		
Comment	Should the UDRA term also be updated to be referenced to the Kalman estimation rather than "prediction" to align with the $t_{op\text{-}D}$ vs. $t_{ok\text{-}D}$ change?		
Directorate Response	This item has been overcome by events as the $t_{ok\text{-}D}$ change will no longer occur and the variable will remain $t_{op\text{-}D}$.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
The $UDRA_{op\text{-}D}$ and UDRA shall give the differential user range accuracy for the SV. It must be noted that the two parameters provide estimated accuracy after both clock and ephemeris DC are applied. The $UDRA_{op\text{-}D}$ and UDRA indices are signed, two's complement integers in the range of +15 to -16 and have the following relationship:	N/A	N/A

Affected Document(s)	IS-GPS-200; IS-GPS-705; IS-GPS-800	**DOORS ID**	IS200-552, IS705-241, IS800-159
Paragraph	200-30.3.3.1.3; 705-20.3.3.1.3; 800-3.5.3	**Comment Number**	3,24
Comment Type	Substantive	**Disposition**	Accept /w Comment
Comment Originator(s)	Roger Kirpes (Rockwell Collins)		
Comment	Tables do not contain parameter descriptions for t_{op} and $t_{ok\text{-}D}$. Please add the new time tag definitions/description to the Message types and parameters Table for $t_{ok\text{-}D}$ and $t_{op\text{-}D}$		
Directorate Response	After discussion involving Aerospace, changes to the variable will be reverted and the $t_{op\text{-}D}$ variable will remain as $t_{op\text{-}D}$. The tables will be updated to reflect the updated name of the t_{op} variable.		

Table 30-I. Message Types 10 and 11 Parameters (1 of 2)

Parameter		No. of Bits**	Scale Factor (LSB)	Effective Range***	Units
WN	Week No.	13	1		weeks
URA_{ED} Index	ED Accuracy Index	5*			(see text)
Signal health (L1/L2/L5)		3	1		(see text)
t_{op}	Data predict time of week	11	300	604,500	seconds
ΔA ****	Semi-major axis difference at reference time	26*	2^{-9}		meters
$\dot{A}$	Change rate in semi-major axis	25*	2^{-21}		meters/sec
Δn_0	Mean Motion difference from computed value at reference time	17*	2^{-44}		semi-circles/sec
$\Delta \dot{n}_0$	Rate of mean motion difference from computed value	23*	2^{-57}		semi-circles/sec^2
$M_{0\text{-}n}$	Mean anomaly at reference time	33*	2^{-32}		semi-circles
e_n	Eccentricity	33	2^{-34}	0.03	dimensionless
ω_n	Argument of perigee	33*	2^{-32}		semi-circles

* Parameters so indicated are two's complement, with the sign bit (+ or -) occupying the MSB;
** See Figure 30-1 for complete bit allocation in Message Type 10;
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with indicated bit allocation and scale factor.
**** Relative to A_{REF} = 26,559,710 meters.

Table 30-I. Message Types 10 and 11 Parameters (1 of 2)

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
WN	Week No.	13	1		weeks
URA_{ED} Index	ED Accuracy Index	5*			(see text)
Signal health (L1/L2/L5)		3	1		(see text)
t_{op}	ICE Data ~~predict~~ projection sequence time of week	11	300	0 to 604,500	seconds
ΔA ****	Semi-major axis difference at reference time	26*	2^{-9}		meters
$\dot{A}$	Change rate in semi-major axis	25*	2^{-21}		meters/sec
Δn_0	Mean Motion difference from computed value at reference time	17*	2^{-44}		semi-circles/sec
$\Delta \dot{n}_0$	Rate of mean motion difference from computed value	23*	2^{-57}		semi-circles/sec^2
$M_{0\text{-}n}$	Mean anomaly at reference time	33*	2^{-32}		semi-circles
e_n	Eccentricity	33	2^{-34}	0.0 to 0.03	dimensionless
ω_n	Argument of perigee	33*	2^{-32}		semi-circles

* Parameters so indicated are two's complement, with the sign bit (+ or -) occupying the MSB;
** See Figure 30-1 for complete bit allocation in Message Type 10;
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.
**** Relative to A_{REF} = 26,559,710 meters.

Table 30-I. Message Types 10 and 11 Parameters (1 of 2)

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
WN	Week No.	13	1		weeks
URA_{ED} Index	ED Accuracy Index	5*			(see text)
Signal health (L1/L2/L5)		3	1		(see text)
t_{op}	CEI ~~ICE~~ Data projection sequence time of week	11	300	0 to 604,500	seconds
ΔA ****	Semi-major axis difference at reference time	26*	2^{-9}		meters
$\dot{A}$	Change rate in semi-major axis	25*	2^{-21}		meters/sec
Δn_0	Mean Motion difference from computed value at reference time	17*	2^{-44}		semi-circles/sec
$\Delta \dot{n}_0$	Rate of mean motion difference from computed value	23*	2^{-57}		semi-circles/sec^2
$M_{0\text{-}n}$	Mean anomaly at reference time	33*	2^{-32}		semi-circles
e_n	Eccentricity	33	2^{-34}	0.0 to 0.03	dimensionless
ω_n	Argument of perigee	33*	2^{-32}		semi-circles

* Parameters so indicated are two's complement, with the sign bit (+ or -) occupying the MSB;
** See Figure 30-1 for complete bit allocation in Message Type 10;
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.
**** Relative to A_{REF} = 26,559,710 meters.

**See next chart for enlarged table*

Proposed Text

Table 30-I. Message Types 10 and 11 Parameters (1 of 2)

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
WN	Week No.	13	1		weeks
URA_{ED} Index	ED Accuracy Index	5*			(see text)
Signal health (L1/L2/L5)		3	1		(see text)
t_{op}	CEI ~~ICE~~ Data projection sequence time of week	11	300	0 to 604,500	seconds
ΔA ****	Semi-major axis difference at reference time	26*	2^{-9}		meters
$\dot{A}$	Change rate in semi-major axis	25*	2^{-21}		meters/sec
Δn_0	Mean Motion difference from computed value at reference time	17*	2^{-44}		semi-circles/sec
$\dot{\Delta n_0}$	Rate of mean motion difference from computed value	23*	2^{-57}		semi-circles/sec^2
M_{0-n}	Mean anomaly at reference time	33*	2^{-32}		semi-circles
e_n	Eccentricity	33	2^{-34}	0.0 to 0.03	dimensionless
ω_n	Argument of perigee	33*	2^{-32}		semi-circles

* Parameters so indicated are two's complement, with the sign bit (+ or -) occupying the MSB;

** See Figure 30-1 for complete bit allocation in Message Type 10;

*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.

**** Relative to A_{REF} = 26,559,710 meters.

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-475, IS200-476
Paragraph	200-20.3.4.5	**Comment Number**	25,26
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Steven Brown (Lockheed Martin)		
Comment	Missing ICE update		
Directorate Response	After discussion involving Aerospace, acronym was updated to be “Clock/Ephemeris/Integrity (CEI)”. Update will be made.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
When the t_{oe}, immediately prior to a new upload cutover, already reflects a small deviation (i.e. a new upload cutover has occurred in the recent past), then the CS (Block II/IIA/IIR/IIR-M/IIF) and SS (GPS III) shall introduce an additional deviation to the t_{oe} when a new upload is cutover for transmission. A change from the broadcast reference time immediately prior to cutover is used to indicate a change of values in the data set. The user may use the following example algorithm to detect the occurrence of a new upload cutover: DEV = t_{oe} [modulo 3600] If DEV ≠ 0, then a new upload cutover has occurred within past 4 hours.	N/A	When the t_{oe}, immediately prior to a new CEI data projection sequence ~~upload~~ cutover, already reflects a small deviation (i.e. a new CEI data projection sequence ~~upload~~ cutover has occurred in the recent past), then the CS (Block II/IIA/IIR/IIR-M/IIF) and SS (GPS III) shall introduce an additional deviation to the t_{oe} when a new CEI data projection sequence ~~upload~~ is cutover for transmission. A change from the broadcast reference time immediately prior to cutover is used to indicate a change of values in the data set. The user may use the following example algorithm to detect the occurrence of a new CEI data projection sequence ~~upload~~ cutover: DEV = t_{oe} [modulo 3600] If DEV ≠ 0, then a new CEI data projection sequence ~~upload~~ cutover has occurred within past 4 hours.

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-1496, IS200-1497, IS200-1498
Paragraph	200-30.3.4.5	**Comment Number**	30, 92
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Steven Brown (Lockheed Martin) and Denis Bouvet (Thales)		
Comment	Reference Times section for CNAV in Appendix III should also be updated (equivalent to the LNAV changes). Could the ICE data set definition be complemented for CNAV data, as ISC and T_{gd} parameters are also necessary to use the SV in the positioning service? Or should we consider instead that they are implicitly included in the 'etc.' term of related parameters?		
Directorate Response	After discussion involving Aerospace, acronym was updated to be “Clock/Ephemeris/Integrity (CEI)”. CEI can apply for CNAV as well. It’s the equivalent information that is in MICE I, MICE II, and MT 12 in MNAV. Update will be made.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
The CS (Block IIR-M/IIF) and SS (GPS III) shall assure that the t_{oe} value, for at least the first data set transmitted by an SV after a new upload, is different from that transmitted prior to the cutover (see paragraph 30.3.4.4). As such, when a new upload is cutover for transmission, the CS (Block IIR-M/IIF) and SS (GPS III) shall introduce a small deviation in the t_{oe} resulting in the t_{oe} value that is offset from the nominal location of 1.5 hours into the fit interval (see Table 30-XIII). This offset t_{oe} will be transmitted by an SV in the first data set after a new upload cutover and the second data set, following the first data set, may also continue to reflect the same offset in the t_{oe}. When the t_{oe}, immediately prior to a new upload cutover, already reflects a small deviation (i.e. a new upload cutover has occurred in the recent past), then the CS (Block IIR-M/IIF) and SS (GPS III) shall introduce an additional deviation to the t_{oe} when a new upload is cutover for transmission. For CNAV data, the user may use the following example algorithm to detect the occurrence of a new upload cutover: DEV = t_{oe} [modulo 7200] If DEV ≠ 5400, then a new upload cutover has occurred within the past 4 hours.	N/A	The CS (Block IIR-M/IIF) and SS (GPS III) shall assure that the t_{oe} value, for at least the first data set transmitted by an SV after a new CEI data projection sequence ~~upload~~, is different from that transmitted prior to the cutover (see paragraph 30.3.4.4). As such, when a new CEI data projection sequence ~~upload~~ is cutover for transmission, the CS (Block IIR-M/IIF) and SS (GPS III) shall introduce a small deviation in the t_{oe} resulting in the t_{oe} value that is offset from the nominal location of 1.5 hours into the fit interval (see Table 30-XIII). This offset t_{oe} will be transmitted by an SV in the first data set after a new CEI data projection sequence ~~upload~~ cutover and the second data set, following the first data set, may also continue to reflect the same offset in the t_{oe}. When the t_{oe}, immediately prior to a new CEI data projection sequence ~~upload~~ cutover, already reflects a small deviation (i.e. a new CEI data projection sequence ~~upload~~ cutover has occurred in the recent past), then the CS (Block IIR-M/IIF) and SS (GPS III) shall introduce an additional deviation to the t_{oe} when a new CEI data projection sequence ~~upload~~ is cutover for transmission. For CNAV data, the user may use the following example algorithm to detect the occurrence of a new CEI data projection sequence ~~upload~~ cutover: DEV = t_{oe} [modulo 7200] If DEV ≠ 5400, then a new CEI data projection sequence ~~upload~~ cutover has occurred within the past 4 hours. *See next chart for enlarged view

Proposed Text IS200-1496, IS200-1497, IS200-1498

The CS (Block IIR-M/IIF) and SS (GPS III) shall assure that the t_{oe} value, for at least the first data set transmitted by an SV after a new CEI data projection sequence ~~upload~~, is different from that transmitted prior to the cutover (see paragraph 30.3.4.4). As such, when a new CEI data projection sequence ~~upload~~ is cutover for transmission, the CS (Block IIR-M/IIF) and SS (GPS III) shall introduce a small deviation in the t_{oe} resulting in the t_{oe} value that is offset from the nominal location of 1.5 hours into the fit interval (see Table 30-XIII). This offset t_{oe} will be transmitted by an SV in the first data set after a new CEI data projection sequence ~~upload~~ cutover and the second data set, following the first data set, may also continue to reflect the same offset in the t_{oe}.

When the t_{oe}, immediately prior to a new CEI data projection sequence ~~upload~~ cutover, already reflects a small deviation (i.e. a new CEI data projection sequence ~~upload~~ cutover has occurred in the recent past), then the CS (Block IIR-M/IIF) and SS (GPS III) shall introduce an additional deviation to the t_{oe} when a new CEI data projection sequence ~~upload~~ is cutover for transmission.

For CNAV data, the user may use the following example algorithm to detect the occurrence of a new CEI data projection sequence ~~upload~~ cutover:

DEV = t_{oe} [modulo 7200]

If DEV ≠ 5400, then a new CEI data projection sequence ~~upload~~ cutover has occurred within the past 4 hours.

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-1399, IS705-1477
Paragraph	200-30.3.4.4; 705-20.3.4.4	**Comment Number**	32
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Steven Brown (Lockheed Martin)		
Comment	Text should be updated as well to refer to ICE data projection sequences vs. uploads.		
Directorate Response	After discussion involving Aerospace, acronym was updated to be “Clock/Ephemeris/Integrity (CEI)”. Update will be made.		

BASELINE TEXT (WAS) ***Includes RFC 318 Updates***	**PIRN TEXT (IS)**	**PROPOSED TEXT**
Cutovers to new data sets will occur only on hour boundaries except for the first data set of a new upload. The first data set may be cut-in (reference paragraph 20.3.4.1) at any time during the hour and therefore may be transmitted by the SV for less than one hour. The start of the transmission interval for each data set corresponds to the beginning of the curve fit interval for the data set. Each data set remains valid for the duration of its transmission interval, and nominally also remains valid for the duration of its curve fit interval. A data set is rendered invalid before the end of its curve fit interval when it is superseded by the SV cutting over to the first data set of a new upload. Normal Operations. The message type 10, 11, and 30-37 data sets are transmitted by the SV for periods of two hours. The corresponding curve fit interval is three hours.	N/A	Cutovers to new data sets will occur only on hour boundaries except for the first data set of a new CEI data projection sequence ~~upload~~. The first data set may be cut-in (reference paragraph 20.3.4.1) at any time during the hour and therefore may be transmitted by the SV for less than one hour. The start of the transmission interval for each data set corresponds to the beginning of the curve fit interval for the data set. Each data set remains valid for the duration of its transmission interval, and nominally also remains valid for the duration of its curve fit interval. A data set is rendered invalid before the end of its curve fit interval when it is superseded by the SV cutting over to the first data set of a new CEI data projection sequence ~~upload~~. Normal Operations. The message type 10, 11, and 30-37 data sets are transmitted by the SV for periods of two hours. The corresponding curve fit interval is three hours.

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-543
Paragraph	200-30.3.3.1.1.3	**Comment Number**	41
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Roger Kirpes (Rockwell Collins)		
Comment	It is not clear that the epoch time of the state data (t_{op}, WN_{op}) used for the projection of the satellite ICE data will be in the past relative to the time of broadcast of that data.		
Directorate Response	WN_{op} and t_{op} will be in the past relative to the time of broadcast of the data; however, this does not mean the parameter can be used to compute the age of the data. This information will not be stated in the text because it is not relevant information for the receiver.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
Bits 55 through 65 of message type 10 shall contain the data predict time of week (t_{op}). The t_{op} term provides the epoch time of week of the state estimate utilized for the prediction of satellite quasi-Keplerian ephemeris parameters.	Bits 55 through 65 of message type 10 shall contain the ICE data ~~predict~~ projection sequence time of week (t_{op}). The t_{op} term provides the epoch time of week of the state ~~estimate~~ data utilized for the ~~prediction~~ projection of satellite ICE data quasi-Keplerian ephemeris parameters. Users are cautioned to avoid using this parameter to compute age of data for any SV.	Bits 55 through 65 of message type 10 shall contain the CEI ~~ICE~~ data projection sequence time of week (t_{op}). The t_{op} term provides the epoch time of week of the state data utilized for the projection of satellite CEI ~~ICE~~ data quasi-Keplerian ephemeris parameters. Users are cautioned to avoid using this parameter to compute age of data for any SV.

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-564
Paragraph	200-30.3.3.2.1.2	**Comment Number**	42
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Roger Kirpes (Rockwell Collins)		
Comment	It is not clear if clock and ephemeris data must have same t_{op}, as well as same t_{oe}/t_{oc}, in order to be utilized as an ICE data set. Clarify that clock and ephemeris data must have same t_{op}, as well as same t_{oe}/t_{oc}, in order to be utilized as an ICE data set.		
Directorate Response	After discussion involving Aerospace, acronym was updated to be “Clock/Ephemeris/Integrity (CEI)”. t_{oe} and t_{oc} should always match for the CEI data set to be valid; that's the primary way to check. t_{oe} and t_{oc} are not required to match with t_{op}. However, for a secondary check that's more or less redundant t_{op} should match in MT10/11 and MT30.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
Bits 39 through 49 of message types 30 through 37 shall contain the data predict time of week (t_{op}). The t_{op} term provides the epoch time of week of the state estimate utilized for the prediction of SV clock correction coefficients.	Bits 39 through 49 of message types 30 through 37 shall contain the ICE data projection ~~predict~~ time of week (t_{op}). The t_{op} term provides the epoch time of week of the state data ~~estimate~~ utilized for ~~the prediction of~~ projecting the SV clock correction coefficients forward in time.	Bits 39 through 49 of message types 30 through 37 shall contain the CEI ~~ICE~~ data projection time of week (t_{op}). The t_{op} term provides the epoch time of week of the state data utilized for projecting the SV clock correction coefficients forward in time.

Affected Document(s)	IS-GPS-800	**DOORS ID**	IS-GPS-800 Rev D (IS800-871)
Paragraph	800-3.5.5.2	**Comment Number**	61, 64, 75
Comment Type	Substantive	**Disposition**	Accept w/ Comment
Comment Originator(s)	Rhonda Slattery (Aerospace) and Steven Brown (Lockheed Martin)		
Comment	This paragraph was also modified by RFC 318. Those changes are not incorporated in your RFC. Since your RFC is behind in schedule, be careful not to revert to pre-318 language when change is incorporated. Is the last paragraph being deleted from this object or was it intentionally left out of the IS text?		
Directorate Response	Object has been updated to reflect the changes made by RFC 318. All other conflicting objects have been addressed and resolved. After discussion involving Aerospace, acronym was updated to be "Clock/Ephemeris/Integrity (CEI)".		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
The following rule governs the transmission of t_{oe} in different data sets: The transmitted t_{oe} will be different from any value transmitted by the SV during the preceding seven days. Cutovers to new data sets will occur only on hour boundaries except for the first data set of a new upload. The first data set may be cut-in (reference paragraph 3.5.5.1) at any time during the hour and therefore may be transmitted by the SV for less than one hour. The start of the transmission interval for each data set corresponds to the beginning of the curve fit interval for the data set. Each data set remains valid for the duration of its transmission interval, and nominally also remains valid for the duration of its curve fit interval. A data set is rendered invalid before the end of its curve fit interval when it is superseded by the SV cutting over to the first data set of a new upload. Normal Operations. The subframe 2 data sets are transmitted by the SV for periods of two hours. The corresponding curve fit interval is three hours.	The t_{oe} shall be equal to the t_{oc} of the same CNAV data set. The following rules govern the transmission of t_{oe} and t_{oc} values in different data sets: (1) The transmitted t_{oc} will be different from any value transmitted by the SV during the preceding seven days; (2) The transmitted t_{oe} will be different from any value transmitted by the SV during the preceding six hours. Cutovers to new data sets will occur only on hour boundaries except for the first data set of a new CEI data projection sequence. The first data set may be cut-in (reference paragraph 3.5.5.1) at any time during the hour and therefore may be transmitted by the SV for less than one hour. The start of the transmission interval for each data set corresponds to the beginning of the curve fit interval for the data set. Each data set remains valid for the duration of its transmission interval, and nominally also remains valid for the duration of its curve fit interval. A data set is rendered invalid before the end of its curve fit interval when it is superseded by the SV cutting over to the first data set of a new CEI data projection sequence.	The following rule governs the transmission of t_{oe} in different data sets: The transmitted t_{oe} will be different from any value transmitted by the SV during the preceding seven days. Cutovers to new data sets will occur only on hour boundaries except for the first data set of a new CEI data projection sequence ~~upload~~. The first data set may be cut-in (reference paragraph 3.5.5.1) at any time during the hour and therefore may be transmitted by the SV for less than one hour. The start of the transmission interval for each data set corresponds to the beginning of the curve fit interval for the data set. Each data set remains valid for the duration of its transmission interval, and nominally also remains valid for the duration of its curve fit interval. A data set is rendered invalid before the end of its curve fit interval when it is superseded by the SV cutting over to the first data set of a new CEI data projection sequence ~~upload~~. Normal Operations. The subframe 2 data sets are transmitted by the SV for periods of two hours. The corresponding curve fit interval is three hours.

Proposed Text IS800-871

The following rule governs the transmission of t_{oe} in different data sets: The transmitted t_{oe} will be different from any value transmitted by the SV during the preceding seven days.

Cutovers to new data sets will occur only on hour boundaries except for the first data set of a new CEI data projection sequence ~~upload~~. The first data set may be cut-in (reference paragraph 3.5.5.1) at any time during the hour and therefore may be transmitted by the SV for less than one hour.

The start of the transmission interval for each data set corresponds to the beginning of the curve fit interval for the data set. Each data set remains valid for the duration of its transmission interval, and nominally also remains valid for the duration of its curve fit interval. A data set is rendered invalid before the end of its curve fit interval when it is superseded by the SV cutting over to the first data set of a new CEI data projection sequence ~~upload~~.

Normal Operations. The subframe 2 data sets are transmitted by the SV for periods of two hours. The corresponding curve fit interval is three hours.

2016 PUBLIC DOCUMENT CLEANUP

B. Charest
H. Nguyenhuu

RFC-318
2016 Public Document Clean-up

Problem Statement:
Extraneous, ambiguous, redundant, incorrect, or missing editorial and/or administrative information exists within the descriptive texts, phrases and/or references in the public documents (IS-GPS-200, IS-GPS-705, and IS-GPS-800) identified by the Users.
Proposed Solution:
Modify public documents to clarify extraneous, ambiguous, redundant, incorrect, or missing editorial and/or administrative information to enhance the public document quality (clear and concise communication) as suggested by Public Interface Control Working Group (ICWG) participants, stakeholders and key members.
Impacted Documents:
(IS-GPS-200, IS-GPS-705, and IS-GPS-800)

RFC-318 CRM Status

Comment Resolution Matrix (CRM) – COMBINED STAKEHOLDER/DIRECTORATE REVIEW STATUS					
Disposition/Type	**Critical**	**Substantial**	**Administrative**	**Totals**	**Concurrence**
Accept	**0**	**4**	**17**	**21**	**13**
Accept with Comment	**1**	**13**	**34**	**48**	**29**
Reject	**0**	**7**	**2**	**9**	**6**
Defer	**0**	**2**	**2**	**4**	**3**
Grand Totals:	**1**	**26**	**55**	**82**	**51**

Critical Comments (1)

Substantive Comments

Rejected Administrative Comments

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-1508
Paragraph	6.2.7 :	**Comment Number**	75
Comment Type	Critical	**Disposition**	Accept with Comments
Comment Originator(s)	Steven Brown (GPS III/ LM)		
Comment	At the 1 June 2016 RFC-318 TIM, we had agreement to add statements to IS200, IS705, and IS800 to make it clear that it is possible for the system (in this case, a combination of CS and SS) to broadcast data that is outside the "valid range" but it still a value that fits in the available bits/scale factor. In this scenario, the user segment must be the one responsible for detecting the value and marking it invalid. Neither the CS nor the (space segment) SS will have logic to prevent the broadcast of a value outside of the "valid range." There appears to be no statement making this clear, despite the agreement at the 1 June 2016 TIM. Current definition is "Valid Range identifies the range of values used by GPS" but this isn't accurate because it is possible that GPS will broadcast a value that fits in the available bit allocation and scale factor that is outside the "valid range" and users need to know this. Direction provided in a procurement contracting officer letter (PCOL) for the RFC-288 impact assessment is not sufficient visibility to the users nor will it have sufficient longevity.		
Directorate Response	Revise wording to the proposed text.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
From RFC-288: Valid Range identifies the range of values used by GPS. The Valid Range is only for PRNs 1-63.	(New change – This change was not included in the original PIRN submitted for review)	Valid range identifies the range of values ~~used~~ nominally broadcast by GPS. The ~~V~~valid ~~R~~ranges ~~is~~ are only ~~for~~applicable to PRNs 1~~-~~ through 63.

RFC-318
2016 Public Document Clean-up

Critical Comments

Substantive Comments (26)

Rejected Administrative Comments

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-115
Paragraph	3.3.2.2 P-Code Generation	**Comment Number**	3
Comment Type	Substantive	**Disposition**	Reject
Comment Originator(s)	Willard Marquis (Lockheed Martin (LMSSC))		
Comment	Text insertion created a run-on sentence.		
Directorate Response	Understand the concern. However, the change requestor has withdrawn his comments. This proposed change is now Overcome by Events (OBE); therefore, the comment is no longer applicable and rejected. Remove the proposed changes.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
The X2A and X2B epochs are made to precess with respect to the X1A and X1B epochs by causing the X2 period to be 37 chips longer than the X1 period. When the X2A is in the last state of its 3750th cycle and X2B is in the last state of its 3749th cycle, their transitions to their respective initial states are delayed by 37 chip time durations.	The X2A and X2B epochs are made to precess with respect to the X1A and X1B epochs by causing the X2 period to be 37 chips longer than the X1 period. The ~~When~~ 37 chip delay is done by the X2A and X2B clock control functions. The X2A will halt the X2A shift register when it detects the 3750th X2A epoch. Just like the X1B clock control function, the X2B clock control function holds the X2B register upon detection of final state (chip 4093) of its 3749th cycle or when the X2A is in the last state of its 3750th cycle and X2B is in the last state of its 3749th cycle, their transitions to their respective initial states are delayed by 37 chip time durations.	The X2A and X2B epochs are made to precess with respect to the X1A and X1B epochs by causing the X2 period to be 37 chips longer than the X1 period. The 37 chip delay is done by the X2A and X2B clock control functions. The X2A will halt the X2A shift register when it detects the 3750th X2A epoch. As with the X1B clock control function, the X2B clock control function holds the X2B register upon detection of final state (chip 4093) of its 3749th cycle. ~~or~~ The X2B clock control also holds the register when the X2A is in the last state of its 3750th cycle and X2B is in the last state of its 3749th cycle~~,~~. Their transitions to their respective initial states are delayed by 37 chip time durations. *(Note: This proposed change will not be implemented since the change requestor has withdrawn his comments. Text remains As Is in the baseline.)*

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-115
Paragraph	3.3.2.2 P-Code Generation	**Comment Number**	6
Comment Type	Substantive	**Disposition**	Reject
Comment Originator(s)	Mark E Dahle-Melsaether (Lockheed Martin (LMSSC))		
Comment	The "holding" of the process is measured in cycles -- not epochs. I believe the sentence should state "3750th cycle" and not "3750th epoch". 3750 epochs is ~94 mins. These registers get reset to initial conditions every X1 epoch (1.5 sec). Also, add "clock control function" to the second sentence to maintain consistency.		
Directorate Response	Understand the concern. However, the change requestor has withdrawn his comments. This proposed change is now Overcome by Events (OBE); therefore, the comment is no longer applicable and rejected. Remove the proposed changes.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
The X2A and X2B epochs are made to precess with respect to the X1A and X1B epochs by causing the X2 period to be 37 chips longer than the X1 period. When the X2A is in the last state of its 3750th cycle and X2B is in the last state of its 3749th cycle, their transitions to their respective initial states are delayed by 37 chip time durations.	The X2A and X2B epochs are made to precess with respect to the X1A and X1B epochs by causing the X2 period to be 37 chips longer than the X1 period. The ~~When~~ 37 chip delay is done by the X2A and X2B clock control functions. The X2A will halt the X2A shift register when it detects the 3750th X2A epoch. Just like the X1B clock control function, the X2B clock control function holds the X2B register upon detection of final state (chip 4093) of its 3749th cycle or when the X2A is in the last state of its 3750th cycle and X2B is in the last state of its 3749th cycle, their transitions to their respective initial states are delayed by 37 chip time durations.	The X2A and X2B epochs are made to precess with respect to the X1A and X1B epochs by causing the X2 period to be 37 chips longer than the X1 period. The 37 chip delay is done by the X2A and X2B clock control functions. The X2A ~~clock control function~~ will halt the X2A shift register when it detects the 3750th X2A ~~epoch cycle….~~ *(Note: This proposed change will not be implemented since the change requestor has withdrawn his comments. Text remains As Is in the baseline).*

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-108, IS200-115
Paragraph	3.3.2.2 P-Code Generation	**Comment Number**	8
Comment Type	Substantive	**Disposition**	Reject
Comment Originator(s)	Jeff Harvey (Harris)		
Comment	Just wanted to ask the question--why does this text need to change after over 20 years of being adequate?		
Directorate Response	Concur. In fact, the change originator has withdrawn his comments. This proposed change is now Overcome by Events (OBE); therefore, the comment is no longer applicable and rejected. Remove the proposed changes.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
108: The X1 period is defined as the 3750 X1A cycles (15,345,000 chips) which is not an integer number of X1B cycles. To accommodate this situation, the X1B shift register is held in the final state (chip 4093) of its 3749th cycle. It remains in this state until the X1A shift register completes its 3750th cycle (343 additional chips). The completion of the 3750th X1A cycle establishes the next X1 epoch which re-initializes both the X1A and X1B shift registers starting a new X1 cycle. **115:** The X2A and X2B epochs are made to precess with respect to the X1A and X1B epochs by causing the X2 period to be 37 chips longer than the X1 period. When the X2A is in the last state of its 3750th cycle and X2B is in the last state of its 3749th cycle, their transitions to their respective initial states are delayed by 37 chip time durations.	**108:** The X1 period is defined as the 3750 X1A cycles (15,345,000 chips) which is not an integer number of X1B cycles. To accommodate this situation, the X1B ~~shift~~ clock ~~register~~ control ~~is~~ function ~~held~~ holds the shift register in the final state (chip 4093) of its 3749th cycle. It remains in this state until the X1A shift register completes its 3750th cycle (343 additional chips). The completion of the 3750th X1A cycle establishes the next X1 epoch which re-initializes both the X1A and X1B shift registers starting a new X1 cycle. **115:** The X2A and X2B epochs are made to precess with respect to the X1A and X1B epochs by causing the X2 period to be 37 chips longer than the X1 period. The ~~When~~ 37 chip delay is done by the X2A and X2B clock control functions. The X2A will halt the X2A shift register when it detects the 3750th X2A epoch. Just like the X1B clock control function, the X2B clock control function holds the X2B register upon detection of final state (chip 4093) of its 3749th cycle or when the X2A is in the last state of its 3750th cycle and X2B is in the last state of its 3749th cycle, their transitions to their respective initial states are delayed by 37 chip time durations.	N/A *(Note: This proposed change will not be implemented since the change requestor has withdrawn his comments. Text remains As Is in the baseline).*

PIRN Text IS200-108, 115

108: The X1 period is defined as the 3750 X1A cycles (15,345,000 chips) which is not an integer number of X1B cycles. To accommodate this situation, the X1B ~~shift~~ clock ~~register~~ control ~~is~~ function ~~held~~ holds the shift register in the final state (chip 4093) of its 3749th cycle. It remains in this state until the X1A shift register completes its 3750th cycle (343 additional chips). The completion of the 3750th X1A cycle establishes the next X1 epoch which re-initializes both the X1A and X1B shift registers starting a new X1 cycle.

115: The X2A and X2B epochs are made to precess with respect to the X1A and X1B epochs by causing the X2 period to be 37 chips longer than the X1 period. The ~~When~~ 37 chip delay is done by the X2A and X2B clock control functions. The X2A will halt the X2A shift register when it detects the 3750th X2A epoch. Just like the X1B clock control function, the X2B clock control function holds the X2B register upon detection of final state (chip 4093) of its 3749th cycle or when the X2A is in the last state of its 3750th cycle and X2B is in the last state of its 3749th cycle, their transitions to their respective initial states are delayed by 37 chip time durations.

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-97
Paragraph	3.3.2.1 Code Structure	**Comment Number**	10
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Dr. Rhonda Slattery (Aerospace)		
Comment	While the WAS text has both superscripts and subscripts, they seem to have been converted to regular text in the IS section. For example, P sub i becomes Pi. Since the only substantive change appears to be changing from a minus sign to a plus sign, I assume these are inadvertent. It does significantly change the meaning of the formula with 1.023e7^-1. Also, there is still a minus sign in the first paragraph, should that also be a plus?		
Directorate Response	Subscripts and superscripts are in fact correctly shown in DOORS. The Diff function to generate red-lines from DOORS doesn't differentiate the subscripts and superscripts in the PIRNs. Review and Second peer review to ensure all subscripts and superscripts are corrected in the final documents. The (+) is correct. Section 3.3.2.1, Code Structure, bottom of page 19, the two formulas should be consistent. Change formula #1 from using "(t-T)" to read: Pi(t) = Pi-37(t+T) where T will equal 24 hours.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
For PRN codes 1 through 37, the $P_i(t)$ pattern (P-code) is generated by the modulo-2 summation of two PRN codes, X1(t) and X2(t - iT), where T is the period of one P-code chip and equals $(1.023E7)^{-1}$ seconds, while i is an integer from 1 through 37. This allows the generation of 37 unique P(t) code phases (identified in Table 3-Ia) using the same basic code generator. Expanded P-code PRN sequences, $P_i(t)$ where $38 \leq i \leq 63$, are described as follows: $P_i(t) = P_{i-37}(t - T)$ where T will equal 24 hours) therefore, the equation is $P_i(t) = P_{i-37x}(t + i * 24 \text{ hours})$, where i is an integer from 64 to 210, x is an integer portion of (i-1)/37.	For PRN codes 1 through 37, the $P_i(t)$ pattern (P-code) is generated by the modulo-2 summation of two PRN codes, X1(t) and X2(t - iT), where T is the period of one P-code chip and equals $(1.023E7)^{-1}$ seconds, while i is an integer from 1 through 37. This allows the generation of 37 unique P(t) code phases (identified in Table 3-Ia) using the same basic code generator. Expanded P-code PRN sequences, $P_i(t)$ where $38 \leq i \leq 63$, are described as follows: $P_i(t) = P_{i-37}(t -+ T)$ where T will equal 24 hours) therefore, the equation is $P_i(t) = P_{i-37x}(t + i * 24 \text{ hours})$, where i is an integer from 64 to 210, x is an integer portion of (i-1)/37.	N/A

PIRN Text IS200-97

For PRN codes 1 through 37, the $P_i(t)$ pattern (P-code) is generated by the modulo-2 summation of two PRN codes, X1(t) and X2(t - iT), where T is the period of one P-code chip and equals $(1.023E7)^{-1}$ seconds, while i is an integer from 1 through 37. This allows the generation of 37 unique P(t) code phases (identified in Table 3-Ia) using the same basic code generator.

Expanded P-code PRN sequences, $P_i(t)$ where $38 \leq i \leq 63$, are described as follows:

$P_i(t) = P_{i-37}(t \pm T)$ where T will equal 24 hours)

therefore, the equation is

$P_i(t) = P_{i-37x}(t + i * 24 \text{ hours})$,

where i is an integer from 64 to 210, x is an integer portion of (i-1)/37.

Affected Document(s)	N/A	**DOORS ID**	N/A
Paragraph	N/A	**Comment Number**	11
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Dr. Rhonda Slattery (Aerospace)		
Comment	Since DOORS IDs are not published in the publicly releasable document, I thought these PIRNs used the paragraph and page numbering or complete redlines for public review?? This is very difficult to review in context. Also, the Word delivery has internal comments in the file from SE&I personnel, which are inappropriate in an official review copy.		
Directorate Response	Discussed with SE&I DOORS team about the limitation/concern. SE&I is looking into the way to generate PIRN/IRN with DOORS Ids and actual section/paragraph numbers to facilitate the PIRN/IRN review.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	IS-GPS-200; IS-GPS-705	**DOORS ID**	IS200-338, IS705-332
Paragraph	20.3.3.3.3.0-2 (IS200-338) 20.3.3.6.0-2 (IS705-332)	**Comment Number**	12
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Dr. Rhonda Slattery (Aerospace)		
Comment	Not sure how this works, but RFC 288 changed the title of the column to valid range. This RFC should show the title as valid range in the WAS (or effective range in both, if expected to be approved before 288).		
Directorate Response	RFC-288 was approved 7/29/2016. We actually used the wording in RFC-288 as the "WAS". Since RFC-288 has been approved, it would be easier and clearer when we work on the IRN. Note: 20.3.3.3.3.0-2 (IS200-338) proposed change is OBE since the definition of “Valid Range” is covered in IS200-1505 (See Comment No. 52 for more details) Both RFC-288 and RFC-318 change the following DOORS IDs (tables) IS-GPS-200 Table: 338 IS-GPS-705 Tables:313, 332 Use RFC-288 wording as “WAS” for RFC-318		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	IS-GPS-200	**DOORS ID**	*Applies to all tables*
Paragraph	*all tables* 20.3.3.3.3.0-2 (IS200-338- Table 20-I) is shown as an example	**Comment Number**	13
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Dr. Rhonda Slattery (Aerospace)		
Comment	There are a large number of times where the valid range is given only as the max from RFC 288. Why is Table 20-I the only one being modified here?? Some examples are Tables 20-III, 20-VI, etc.		
Directorate Response	We were only modifying the first table (20-I) to include additional information in the notes below, but RFC 288 created a new section containing this information, so we are going to remove the proposed change from RFC 318. Additionally, all of the valid range values have been corrected in RFC 288. Note: 20.3.3.3.3.0-2 (IS200-338) proposed change is OBE since the definition of "Valid Range" is covered in IS200-1505 (See Comment No. 52 for more details)		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
As shown in IRN- IS-200H-003 (RFC-288)	As shown in PIRN-IS-200H-005 (RFC-318). A footnote was added	OBE – Removed the proposed changes.

IS :

Table 20-I. Subframe 1 Parameters

Parameter	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
Code on L2	2	1		(see text)
Week No.	10	1		week
L2 P data flag	1	1		discrete
SV accuracy	4			(see text)
SV health	6	1		discretes
T_{GD}	8*	2^{-31}		seconds
IODC	10			(see text)
t_{oc}	16	2^{4}	0 to 604,784	seconds
a_{f2}	8*	2^{-55}		sec/sec^2
a_{f1}	16*	2^{-43}		sec/sec
a_{f0}	22*	2^{-31}		seconds

* Parameters so indicated shall be two's complement, with the sign bit (+ or -) occupying the MSB;

** See Figure 20-1 for complete bit allocation in subframe;

*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.

Table 20-I. Subframe 1 Parameters

Parameter	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
Code on L2	2	1		discretes
Week No.	10	1		week
L2 P data flag	1	1		discrete
SV accuracy	4			(see text)
SV health	6	1		discretes
T_{GD}	8*	2^{-31}		seconds
IODC	10			(see text)
t_{oc}	16	2^{4}	0 to 604,784	seconds
a_{f2}	8*	2^{-55}		sec/sec^2
a_{f1}	16*	2^{-43}		sec/sec
a_{f0}	22*	2^{-31}		seconds

* Parameters so indicated shall be two's complement, with the sign bit (+ or -) occupying the MSB;

** See Figure 20-1 for complete bit allocation in subframe;

*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor. Identifies the ordinary range of values broadcast by GPS. In extraordinary circumstances, invalid values may be broadcast. The valid ranges are only for PRNs 1-63.

PIRN Text (IS) All Tables

Table 20-I. Subframe 1 Parameters				
Parameter	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
Code on L2	2	1		discretes
Week No.	10	1		week
L2 P data flag	1	1		discrete
SV accuracy	4			(see text)
SV health	6	1		discretes
T_{GD}	8*	2^{-31}		seconds
IODC	10			(see text)
t_{oc}	16	2^{4}	0 to 604,784	seconds
a_{f2}	8*	2^{-55}		sec/sec^2
a_{f1}	16*	2^{-43}		sec/sec
a_{f0}	22*	2^{-31}		seconds

* Parameters so indicated shall be two's complement, with the sign bit (+ or -) occupying the MSB;

** See Figure 20-1 for complete bit allocation in subframe;

*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor. Identifies the ordinary range of values broadcast by GPS. In extraordinary circumstances, invalid values may be broadcast. The valid ranges are only for PRNs 1-63.

OBE

Affected Document(s)	IS-GPS-705	**DOORS ID**	IS705-332
Paragraph	20.3.3.6.2.0-2	**Comment Number**	15
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Dr. Rhonda Slattery (Aerospace)		
Comment	After making the change to the range to read 0 to 604… in 200-338, you didn't make the change here? Be consistent.		
Directorate Response	The change was incorrectly put into DOORS. The correct change has now been updated in DOORS to say 0 to 604,784 (Valid Range). Given that RFC-288 has been CCB approved, we should be using those changes as our "WAS." The PIRN will be updated to reflect this change.		

BASELINE TEXT (WAS)

As shown in IRN-IS-705D-002 (RFC-288)

Table 20-IX. UTC Parameters

Parameter Symbol	Parameter Description	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0-n}	Bias coefficient of GPS time scale relative to UTC time scale	16*	2^{-35}		Seconds
A_{1-n}	Drift coefficient of GPS time scale relative to UTC time scale	13*	2^{-51}		sec/sec
A_{2-n}	Drift rate correction coefficient of GPS time scale relative of UTC time scale	7*	2^{-68}		sec/sec^2
Δt_{LS}	Current or past leap second count	8*	1		seconds
t_{ot}	Time data reference Time of Week	16	2^4	0 to 604,784	seconds
WN_{ot}	Time data reference Week Number	13	1		weeks
WN_{LSF}	Leap second reference Week Number	8	1		weeks
DN	Leap second reference Day Number	4	1	1 to 7	days
Δt_{LSF}	Current or future leap second count	8*	1		seconds

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;
** See Figure 20-6 for complete bit allocation
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.

PIRN TEXT (IS)

Table 20-IX. UTC Parameters

Parameter Symbol	Parameter Description	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0-n}	Bias coefficient of GPS time scale relative to UTC time scale	16*	2^{-35}		Seconds
A_{1-n}	Drift coefficient of GPS time scale relative to UTC time scale	13*	2^{-51}		sec/sec
A_{2-n}	Drift rate correction coefficient of GPS time scale relative of UTC time scale	7*	2^{-68}		sec/sec^2
Δt_{LS}	Current or past leap second count	8*	1		seconds
t_{ot}	Time data reference Time of Week	16	2^4	0 to 604,784	seconds
WN_{ot}	Time data reference Week Number	13	1		weeks
WN_{LSF}	Leap second reference Week Number	~~8~~ 13	1		weeks
DN	Leap second reference Day Number	4	1	1 to 7	days
Δt_{LSF}	Current or future leap second count	8*	1		seconds

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;
** See Figure 20-6 for complete bit allocation
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor;

PROPOSED TEXT

N/A

PIRN Text (IS) IS705-332

Table 20-IX. UTC Parameters

Parameter Symbol	Parameter Description	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0-n}	Bias coefficient of GPS time scale relative to UTC time scale	16*	2^{-35}		Seconds
A_{1-n}	Drift coefficient of GPS time scale relative to UTC time scale	13*	2^{-51}		sec/sec
A_{2-n}	Drift rate correction coefficient of GPS time scale relative of UTC time scale	7*	2^{-68}		sec/sec^2
Δt_{LS}	Current or past leap second count	8*	1		seconds
t_{ot}	Time data reference Time of Week	16	2^4	0 to 604,784	seconds
WN_{ot}	Time data reference Week Number	13	1		weeks
WN_{LSF}	Leap second reference Week Number	~~8~~ 13	1		weeks
DN	Leap second reference Day Number	4	1	1 to 7	days
Δt_{LSF}	Current or future leap second count	8*	1		seconds

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;
** See Figure 20-6 for complete bit allocation
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor;

Affected Document(s)	IS-GPS-800	**DOORS ID**	IS800-159
Paragraph	3.5.3.0-7	**Comment Number**	16
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Dr. Rhonda Slattery (Aerospace)		
Comment	Why is only toe shown as 0 to …. And not all time of weeks?		
Directorate Response	The change was incorrectly put into DOORS. The correct change has now been updated in DOORS and the values in question are now a range, rather than a single value. (Also reviewed proposed changes to other tables in IS-GPS-800, section 3.5-1, 3.5-3, 3.5-4, 3.5-5, 3.5-6, 3.5-7, 3.5-8)		

BASELINE TEXT (WAS)

Table 3.5-1. Subframe 2 Parameters (1 of 3)

Parameter		No. of Bits**	Scale Factor (LSB)	Effective Range***	Units
WN	Week No.	13	1		weeks
ITOW	Interval time of week	8		83	(see text)
t_{op}	Data predict time of week	11	300	604,500	seconds
L1C health		1			(see text)
URA_{ED} Index	ED accuracy index	5*			(see text)
t_{oe}	Ephemeris/clock data reference time of week	11	300	604,500	seconds
ΔA ****	Semi-major axis difference at reference time	26*	2^{-9}		meters
$\dot{A}$	Change rate in semi-major axis	25*	2^{-21}		meters/sec
Δn_0	Mean Motion difference from computed value at reference time	17*	2^{-44}		semi-circles/sec
$\dot{\Delta n_0}$	Rate of mean motion difference from computed value	23*	2^{-57}		semi-circles/sec^2
M_{0-n}	Mean anomaly at reference time	33*	2^{-32}		semi-circles
e_n	Eccentricity	33	2^{-34}		dimensionless
ω_n	Argument of perigee	33*	2^{-32}		semi-circles

* Parameters so indicated are in two's complement notation;
** See Figure 3.5-1 for complete bit allocation in Subframe 2;
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with indicated bit allocation and scale factor.
**** Relative to A_{REF} = 26,559,710 meters.

PIRN TEXT (IS)

Table 3.5-1. Subframe 2 Parameters (1 of 3)

Parameter		No. of Bits**	Scale Factor (LSB)	~~Effective Range~~ Valid Range***	Units
WN	Week No.	13	1		weeks
ITOW	Interval time of week	8		0 to 83	(see text)
t_{op}	Data predict time of week	11	300	0 to 604,500	seconds
L1C health		1			(see text)
URA_{ED} Index	ED accuracy index	5*			(see text)
t_{oe}	Ephemeris/clock data reference time of week	11	300	0 to 604,500	seconds
ΔA ****	Semi-major axis difference at reference time	26*	2^{-9}		meters
$\dot{A}$	Change rate in semi-major axis	25*	2^{-21}		meters/sec
Δn_0	Mean Motion difference from computed value at reference time	17*	2^{-44}		semi-circles/sec
$\dot{\Delta n_0}$	Rate of mean motion difference from computed value	23*	2^{-57}		semi-circles/sec^2
M_{0-n}	Mean anomaly at reference time	33*	2^{-32}		semi-circles
e_n	Eccentricity	33	2^{-34}	0.0 to 0.03	dimensionless
ω_n	Argument of perigee	33*	2^{-32}		semi-circles

* Parameters so indicated are in two's complement notation;
** See Figure 3.5-1 for complete bit allocation in Subframe 2;
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.
**** Relative to A_{REF} = 26,559,710 meters.

PROPOSED TEXT

N/A

PIRN Text (IS) IS800-159

Table 3.5-1. Subframe 2 Parameters (1 of 3)

Parameter		No. of Bits**	Scale Factor (LSB)	~~Effective Range~~ Valid Range***	Units
WN	Week No.	13	1		weeks
ITOW	Interval time of week	8		0 to 83	(see text)
t_{op}	Data predict time of week	11	300	0 to 604,500	seconds
L1C health		1			(see text)
URA_{ED} Index	ED accuracy index	5*			(see text)
t_{oe}	Ephemeris/clock data reference time of week	11	300	0 to 604,500	seconds
ΔA ****	Semi-major axis difference at reference time	26*	2^{-9}		meters
$\dot{A}$	Change rate in semi-major axis	25*	2^{-21}		meters/sec
Δn_0	Mean Motion difference from computed value at reference time	17*	2^{-44}		semi-circles/sec
$\dot{\Delta n_0}$	Rate of mean motion difference from computed value	23*	2^{-57}		semi-circles/sec^2
M_{0-n}	Mean anomaly at reference time	33*	2^{-32}		semi-circles
e_n	Eccentricity	33	2^{-34}	0.0 to 0.03	dimensionless
ω_n	Argument of perigee	33*	2^{-32}		semi-circles

* Parameters so indicated are in two's complement notation;
** See Figure 3.5-1 for complete bit allocation in Subframe 2;
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.
**** Relative to A_{REF} = 26,559,710 meters.

Affected Document(s)	IS-GPS-800	**DOORS ID**	IS800-159, IS800-160, IS800-161, IS800-224, IS800-236, IS800-241, IS800-260, IS800-263, IS800-280
Paragraph	N/A	**Comment Number**	17
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Dr. Rhonda Slattery (Aerospace)		
Comment	Do these changes do not match the final agreed to RFC 288 changes? They do not match the PIRN and the (interface revision notice) IRN has not yet been published for comparison. If the 0-604… change is in the IRN for just one variable, the way you have it here, we should fix all the others in this RFC.		
Directorate Response	All of the changes to the 800 document were removed from 288 and are being addressed here in 318. RFC 288 did not modify the 800 document, but all occurrences of the "0 to 604,500" have been fixed in this RFC.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	IS-GPS-800	**DOORS ID**	IS800-241
Paragraph	3.5.4.2.3.0-2	**Comment Number**	18
Comment Type	Substantive	**Disposition**	Defer
Comment Originator(s)	Dr. Rhonda Slattery (Aerospace)		
Comment	Why are the given ranges on PM_X, etc removed? The goal of RFC 288 and this part of 318 should be to add clarification, not remove it.		
Directorate Response	The given ranges were removed to be consistent with the similar changes in RFC-288 (CCB approved 7/29/2016). Understand the concern that there IS a valid range for these parameters, that is more constrained than the full range that RFC 288 implies. This is a technical change to the content of the document that exceeds the administrative scope of this RFC. Recommend to leave the proposed change "As Is" to be consistent with RFC-288, submit a concern in eGPS to address the issue, and address in a separate RFC.		

BASELINE TEXT (WAS)

Table 3.5-5. Earth Orientation Parameters

Parameter		No. of Bits**	Scale Factor (LSB)	Effective Range***	Units
t_{EOP}	EOP Data Reference Time	16	2^4	604,784	seconds
$PM\_X^{\dagger}$	X-Axis Polar Motion Value at Reference Time.	21*	2^{-20}	1	arc-seconds
$\dot{PM}\_X$	X-Axis Polar Motion Drift at Reference Time.	15*	2^{-21}	7.8125×10^{-3}	arc-seconds/day
$PM\_Y^{\dagger\dagger}$	Y-Axis Polar Motion Value at Reference Time.	21*	2^{-20}	1	arc-seconds
$\dot{PM}\_Y$	Y-Axis Polar Motion Drift at Reference Time.	15*	2^{-21}	7.8125×10^{-3}	arc-seconds/day
$\Delta UT1^{\dagger\dagger\dagger}$	UT1-UTC Difference at Reference Time.	31*	2^{-24}	64	seconds
$\dot{\Delta UT1}^{\dagger\dagger\dagger}$	Rate of UT1-UTC Difference at Reference Time	19*	2^{-25}	7.8125×10^{-3}	seconds/day

* Parameters so indicated are in two's complement notation;
** See Figure 3.5-3 for complete bit allocation in subframe 3, page 2;
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with indicated bit allocation and scale factor.
$\dagger$ Represents the predicted angular displacement of instantaneous Celestial Ephemeris Pole with respect to semi-minor axis of the reference ellipsoid along Greenwich meridian.
$\dagger\dagger$ Represents the predicted angular displacement of instantaneous Celestial Ephemeris Pole with respect to semi-minor axis of the reference ellipsoid on a line directed 90° west of Greenwich meridian.
$\dagger\dagger\dagger$ With zonal tides restored.

PIRN TEXT (IS)

Table 3.5-5. Earth Orientation Parameters

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range ~~Effective Range~~***	Units
t_{EOP}	EOP Data Reference Time	16	2^4	0 to 604,784	seconds
$PM\_X^{\dagger}$	X-Axis Polar Motion Value at Reference Time.	21*	2^{-20}	~~1~~	arc-seconds
$\dot{PM}\_X$	X-Axis Polar Motion Drift at Reference Time.	15*	2^{-21}	~~7.8125×10^{-3}~~	arc-seconds/day
$PM\_Y^{\dagger\dagger}$	Y-Axis Polar Motion Value at Reference Time.	21*	2^{-20}	~~1~~	arc-seconds
$\dot{PM}\_Y$	Y-Axis Polar Motion Drift at Reference Time.	15*	2^{-21}	~~7.8125×10^{-3}~~	arc-seconds/day
$\Delta UT1^{\dagger\dagger\dagger}$	UT1-UTC Difference at Reference Time.	31*	2^{-24}	~~64~~	seconds
$\dot{\Delta UT1}^{\dagger\dagger\dagger}$	Rate of UT1-UTC Difference at Reference Time	19*	2^{-25}	~~7.8125×10^{-3}~~	seconds/day

* Parameters so indicated are in two's complement notation;
** See Figure 3.5-3 for complete bit allocation in subframe 3, page 2;
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with indicated bit allocation and scale factor.
$\dagger$ Represents the predicted angular displacement of instantaneous Celestial Ephemeris Pole with respect to semi-minor axis of the reference ellipsoid along Greenwich meridian.
$\dagger\dagger$ Represents the predicted angular displacement of instantaneous Celestial Ephemeris Pole with respect to semi-minor axis of the reference ellipsoid on a line directed 90° west of Greenwich meridian.
$\dagger\dagger\dagger$ With zonal tides restored.

PROPOSED TEXT

N/A

PIRN Text (IS) IS800-241

Table 3.5-5. Earth Orientation Parameters

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range ~~Effective Range~~***	Units
t_{EOP}	EOP Data Reference Time	16	2^{4}	0 to 604,784	seconds
PM_X †	X-Axis Polar Motion Value at Reference Time.	21*	2^{-20}	~~1~~	arc-seconds
$\dot{PM}$_X	X-Axis Polar Motion Drift at Reference Time.	15*	2^{-21}	~~7.8125×10^{-3}~~	arc-seconds/day
PM_Y ††	Y-Axis Polar Motion Value at Reference Time.	21*	2^{-20}	~~1~~	arc-seconds
$\dot{PM}$_Y	Y-Axis Polar Motion Drift at Reference Time.	15*	2^{-21}	~~7.8125×10^{-3}~~	arc-seconds/day
ΔUT1 †††	UT1-UTC Difference at Reference Time.	31*	2^{-24}	~~64~~	seconds
$\dot{\Delta UT1}$ †††	Rate of UT1-UTC Difference at Reference Time	19*	2^{-25}	~~7.8125×10^{-3}~~	seconds/day

* Parameters so indicated are in two's complement notation;

** See Figure 3.5-3 for complete bit allocation in subframe 3, page 2;

*** Unless otherwise indicated in this column, effective range is the maximum range attainable with indicated bit allocation and scale factor.

† Represents the predicted angular displacement of instantaneous Celestial Ephemeris Pole with respect to semi-minor axis of the reference ellipsoid along Greenwich meridian.

†† Represents the predicted angular displacement of instantaneous Celestial Ephemeris Pole with respect to semi-minor axis of the reference ellipsoid on a line directed 90° west of Greenwich meridian.

††† With zonal tides restored.

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-1286
Paragraph	3.2.1.5.1.0-4	**Comment Number**	20
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Bruce Charest (GPSW/EN)		
Comment	The "was" table is identical to the "is" table.		
Directorate Response	Understand the fonts were small and hard to read. However, please note: Table 3-1b, Expanded Code Phase Assignments, SV-82's P-code Relative Advance from P13(t-24) to P13(t+24) SV-85's P-code Relative Advance from P16(t+-24) to P16(t+24)		

BASELINE TEXT (WAS)

Table 3-Ib. Expanded Code Phase Assignments (III and subsequent blocks only)

SV ID No.	GPS PRN Signal No.	Code Phase Selection			P-code Relative Advance (Hours) **	First 10 Chips Octal* C/A	First 12 Chips Octal P
		G2 Delay (Chips)	Initial G2 Setting (Octal)*	X2 Delay (Chips)			
70	38	67	0017	1	$P_1(t+24)$	1760	3373
71	39	103	0541	2	$P_2(t+24)$	1236	3757
72	40	91	1714	3	$P_3(t+24)$	0063	7545
73	41	19	1151	4	$P_4(t+24)$	0626	5440
74	42	679	1651	5	$P_5(t+24)$	0126	4402
75	43	225	0103	6	$P_6(t+24)$	1674	4023
76	44	625	0543	7	$P_7(t+24)$	1234	0233
77	45	946	1506	8	$P_8(t+24)$	0271	2337
78	46	638	1065	9	$P_9(t+24)$	0712	3375
79	47	161	1564	10	$P_{10}(t+24)$	0213	3754
80	48	1001	1365	11	$P_{11}(t+24)$	0412	3544
81	49	554	1541	12	$P_{12}(t+24)$	0236	7440
82	50	280	1327	13	$P_{13}(t-24)$	0450	1402
83	51	710	1716	14	$P_{14}(t+24)$	0061	6423
84	52	709	1635	15	$P_{15}(t+24)$	0142	1033
85	53	775	1002	16	$P_{16}(t+-24)$	0775	2637
86	54	864	1015	17	$P_{17}(t+24)$	0762	7135
87	55	558	1666	18	$P_{18}(t+24)$	0111	5674
88	56	220	0177	19	$P_{19}(t+24)$	1600	0514
89	57	397	1353	20	$P_{20}(t+24)$	0424	6064
90	58	55	0426	21	$P_{21}(t+24)$	1351	1210
91	59	898	0227	22	$P_{22}(t+24)$	1550	6726
92	60	759	0506	23	$P_{23}(t+24)$	1271	1171
93	61	367	0336	24	$P_{24}(t+24)$	1441	6656
94	62	299	1333	25	$P_{25}(t+24)$	0444	1105
95	63	1018	1745	26	$P_{26}(t+24)$	0032	6660

*In the octal notation for the first 10 chips of the C/A-code or the initial settings as shown in this table, the first digit (1/0) represents a "1" or "0", respectively, for the first chip and the last three digits are the conventional octal representation of the remaining 9 chips

(For example, the first 10 chips of the C/A code for PRN Signal Assembly No. 38 are: 1111110000).

** $P_i(t+N)$: P-code sequence of PRN number i shifted by N hours. See Section 3.3.2.1.

NOTE #1: The code phase assignments constitute inseparable pairs, each consisting of a specific C/A and a specific P code phase, as shown above.

NOTE #2: PRNs 38-63 are required per this Table if a manufacturer chooses to include these PRNs in their receiver design.

PIRN TEXT (IS)

Table 3-Ib. Expanded Code Phase Assignments (III and subsequent blocks only)

SV ID No.	GPS PRN Signal No.	Code Phase Selection			P-code Relative Advance (Hours) **	First 10 Chips Octal* C/A	First 12 Chips Octal P
		G2 Delay (Chips)	Initial G2 Setting (Octal)*	X2 Delay (Chips)			
70	38	67	0017	1	$P_1(t+24)$	1760	3373
71	39	103	0541	2	$P_2(t+24)$	1236	3757
72	40	91	1714	3	$P_3(t+24)$	0063	7545
73	41	19	1151	4	$P_4(t+24)$	0626	5440
74	42	679	1651	5	$P_5(t+24)$	0126	4402
75	43	225	0103	6	$P_6(t+24)$	1674	4023
76	44	625	0543	7	$P_7(t+24)$	1234	0233
77	45	946	1506	8	$P_8(t+24)$	0271	2337
78	46	638	1065	9	$P_9(t+24)$	0712	3375
79	47	161	1564	10	$P_{10}(t+24)$	0213	3754
80	48	1001	1365	11	$P_{11}(t+24)$	0412	3544
81	49	554	1541	12	$P_{12}(t+24)$	0236	7440
82	50	280	1327	13	$P_{13}(t+24)$	0450	1402
83	51	710	1716	14	$P_{14}(t+24)$	0061	6423
84	52	709	1635	15	$P_{15}(t+24)$	0142	1033
85	53	775	1002	16	$P_{16}(t+24)$	0775	2637
86	54	864	1015	17	$P_{17}(t+24)$	0762	7135
87	55	558	1666	18	$P_{18}(t+24)$	0111	5674
88	56	220	0177	19	$P_{19}(t+24)$	1600	0514
89	57	397	1353	20	$P_{20}(t+24)$	0424	6064
90	58	55	0426	21	$P_{21}(t+24)$	1351	1210
91	59	898	0227	22	$P_{22}(t+24)$	1550	6726
92	60	759	0506	23	$P_{23}(t+24)$	1271	1171
93	61	367	0336	24	$P_{24}(t+24)$	1441	6656
94	62	299	1333	25	$P_{25}(t+24)$	0444	1105
95	63	1018	1745	26	$P_{26}(t+24)$	0032	6660

*In the octal notation for the first 10 chips of the C/A-code or the initial settings as shown in this table, the first digit (1/0) represents a "1" or "0", respectively, for the first chip and the last three digits are the conventional octal representation of the remaining 9 chips

(For example, the first 10 chips of the C/A code for PRN Signal Assembly No. 38 are: 1111110000).

** $P_i(t+N)$: P-code sequence of PRN number i shifted by N hours. See Section 3.3.2.1.

NOTE #1: The code phase assignments constitute inseparable pairs, each consisting of a specific C/A and a specific P code phase, as shown above.

NOTE #2: PRNs 38-63 are required per this Table if a manufacturer chooses to include these PRNs in their receiver design.

PROPOSED TEXT

N/A

PIRN Text (IS)

Table 3-Ib. Expanded Code Phase Assignments (III and subsequent blocks only)

SV ID No.	GPS PRN Signal No.	Code Phase Selection			P-code Relative Advance (Hours) **	First 10 Chips Octal* C/A	First 12 Chips Octal P
		G2 Delay (Chips)	Initial G2 Setting (Octal)*	X2 Delay (Chips)			
70	38	67	0017	1	$P_1(t+24)$	1760	3373
71	39	103	0541	2	$P_2(t+24)$	1236	3757
72	40	91	1714	3	$P_3(t+24)$	0063	7545
73	41	19	1151	4	$P_4(t+24)$	0626	5440
74	42	679	1651	5	$P_5(t+24)$	0126	4402
75	43	225	0103	6	$P_6(t+24)$	1674	4023
76	44	625	0543	7	$P_7(t+24)$	1234	0233
77	45	946	1506	8	$P_8(t+24)$	0271	2337
78	46	638	1065	9	$P_9(t+24)$	0712	3375
79	47	161	1564	10	$P_{10}(t+24)$	0213	3754
80	48	1001	1365	11	$P_{11}(t+24)$	0412	3544
81	49	554	1541	12	$P_{12}(t+24)$	0236	7440
82	50	280	1327	13	$P_{13}(t+24)$	0450	1402
83	51	710	1716	14	$P_{14}(t+24)$	0061	6423
84	52	709	1635	15	$P_{15}(t+24)$	0142	1033
85	53	775	1002	16	$P_{16}(t+24)$	0775	2637
86	54	864	1015	17	$P_{17}(t+24)$	0762	7135
87	55	558	1666	18	$P_{18}(t+24)$	0111	5674
88	56	220	0177	19	$P_{19}(t+24)$	1600	0514
89	57	397	1353	20	$P_{20}(t+24)$	0424	6064
90	58	55	0426	21	$P_{21}(t+24)$	1351	1210
91	59	898	0227	22	$P_{22}(t+24)$	1550	6726
92	60	759	0506	23	$P_{23}(t+24)$	1271	1171
93	61	367	0336	24	$P_{24}(t+24)$	1441	6656
94	62	299	1333	25	$P_{25}(t+24)$	0444	1105
95	63	1018	1745	26	$P_{26}(t+24)$	0032	6660

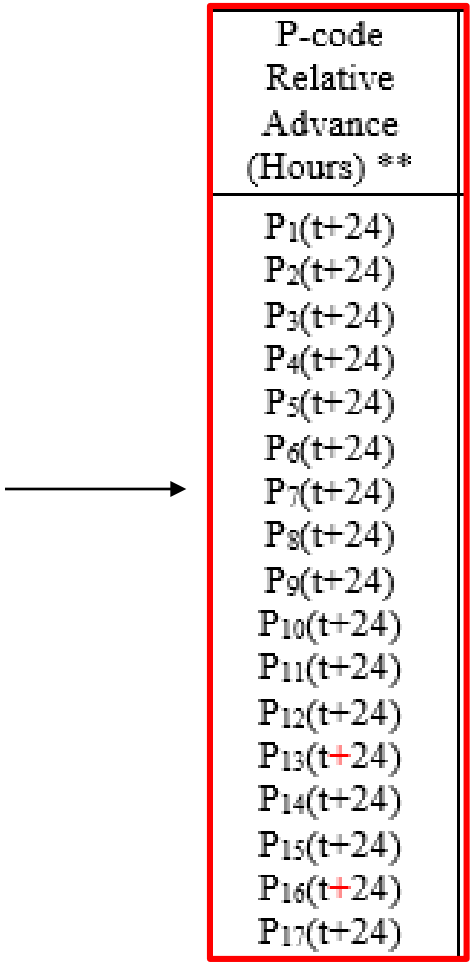
*In the octal notation for the first 10 chips of the C/A-code or the initial settings as shown in this table, the first digit (1/0) represents a "1" or "0", respectively, for the first chip and the last three digits are the conventional octal representation of the remaining 9 chips

(For example, the first 10 chips of the C/A code for PRN Signal Assembly No. 38 are: 1111110000).

** $P_i(t+N)$: P-code sequence of PRN number i shifted by N hours. See Section 3.3.2.1.

NOTE #1: The code phase assignments constitute inseparable pairs, each consisting of a specific C/A and a specific P code phase, as shown above.

NOTE #2: PRNs 38-63 are required per this Table if a manufacturer chooses to include these PRNs in their receiver design.



Affected Document(s)	IS-GPS-800	**DOORS ID**	IS800-655
Paragraph	3.5.4.2.1	**Comment Number**	28
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Bruce Charest (GPSW/EN)		
Comment	Verbose and consequently confusing.		
Directorate Response	Updated proposed text to reflect group consensus on 24 Aug 16.		

BASELINE TEXT (WAS)	PIRN TEXT (IS) (in the initial PIRN)	PROPOSED TEXT
000 = no data available, 001 = Galileo, 010 = GLONASS, 011 through 111 = reserved for other systems.	000 = no data available, 001 = Galileo, 010 = GLONASS, 011 through 111 = Rreserved ~~for other systems~~ in order to preserve the use of these values in a future version of this IS. Until such a revision, the user segment developing to this version of this IS should interpret these values as indicating that the GPS/GNSS Time Offset Parameter data, to which the GNSS Type ID applies, is presently unusable.	By Mr. Bruce Charest: Reserved ~~in order to preserve the use of these values in a future version of this IS. Until such a revision, the user segment developing to this version of this IS should interpret these values as indicating that the GPS/GNSS Time Offset Parameter data, to which the GNSS Type ID applies, is~~ for future GNSS systems. These values are presently unusable. By discussion consensus (8/24/2016): Reserved in order to preserve the use of these values in a future version of this IS. Until such a revision, ~~the user segment~~ a developer developing to this version of this IS should interpret these values as indicating that the GPS/GNSS Time Offset Parameter data, to which the GNSS Type ID applies, is presently unusable.

Affected Document(s)	IS-GPS-705	**DOORS ID**	IS705-313
Paragraph	20.3.3.4.6.2.1.0-3	**Comment Number**	30
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Bruce Charest (GPSW/EN)		
Comment	Changes to table not clearly identified.		
Directorate Response	Just the 5 *****. Understand the frustration but the DIFF function in DOORS doesn't work for changes in a figure or table. This is a DOORS limitation. Thank you for your understanding.		

BASELINE TEXT (WAS)

Table 20-VI. Reduced Almanac Parameters

Parameter*****	No. of Bits	Scale Factor (LSB)	Effective Range **	Units
δ_A ***	8 *	2^{-9}	**	meters
Ω_0	7 *	2^{-6}	**	semi-circles
Φ_0 ****	7 *	2^{-6}	**	semi-circles

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;

** Effective range is the maximum range attainable with indicated bit allocation and scale factor;

*** Relative to A_{ref} = 26,559,710 meters;

**** Φ_0 = Argument of Latitude at Reference Time = $M_0 + \omega$;

***** Relative to following reference values:

$e = 0$

δ_i = +0.0056 semi-circles (i = 55 degrees)

$\dot{\Omega}$ =-2.6 x 10^{-9} semi-circles/second

PIRN TEXT (IS)

Table 20-VI. Reduced Almanac Parameters*****

Parameter*****	No. of Bits	Scale Factor (LSB)	Valid Range **	Units
δ_A ***	8 *	2^{-9}	**	meters
Ω_0	7 *	2^{-6}	**	semi-circles
Φ_0 ****	7 *	2^{-6}	**	semi-circles

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;

** Valid range is the maximum range attainable with indicated bit allocation and scale factor;

*** Relative to A_{ref} = 26,559,710 meters;

**** Φ_0 = Argument of Latitude at Reference Time = $M_0 + \omega$;

***** Relative to following reference values:

$e = 0$

δ_i = +0.0056 semi-circles (i = 55 degrees)

$\dot{\Omega}$ =-2.6 x 10^{-9} semi-circles/second

PROPOSED TEXT

N/A

PIRN Text (IS) IS705-313

Table 20-VI. Reduced Almanac Parameters*****

Parameter*****	No. of Bits	Scale Factor (LSB)	Valid Range **	Units
δ_A ***	8 *	2^{+9}	**	meters
Ω_0	7 *	2^{-6}	**	semi-circles
Φ_0 ****	7 *	2^{-6}	**	semi-circles

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;

** Valid range is the maximum range attainable with indicated bit allocation and scale factor;

*** Relative to A_{ref} = 26,559,710 meters;

**** Φ_0 = Argument of Latitude at Reference Time = $M_0 + \omega$;

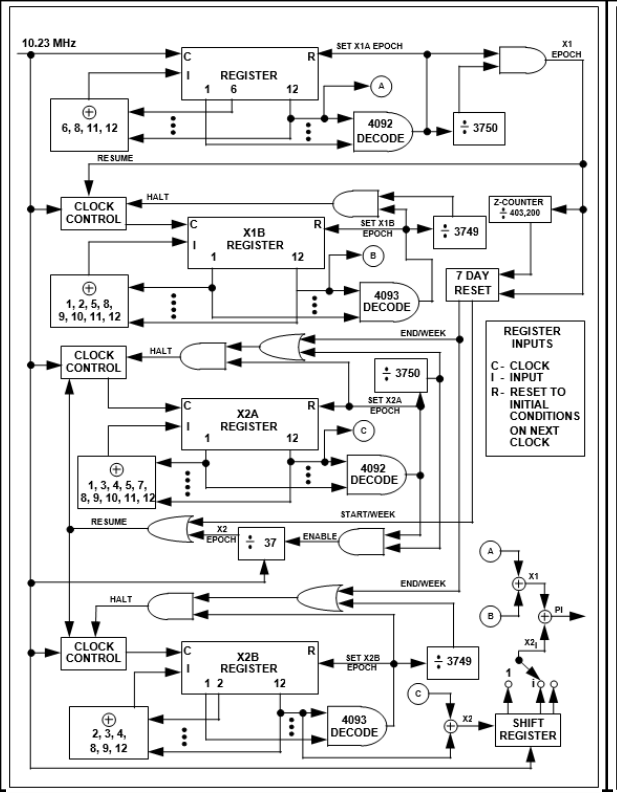
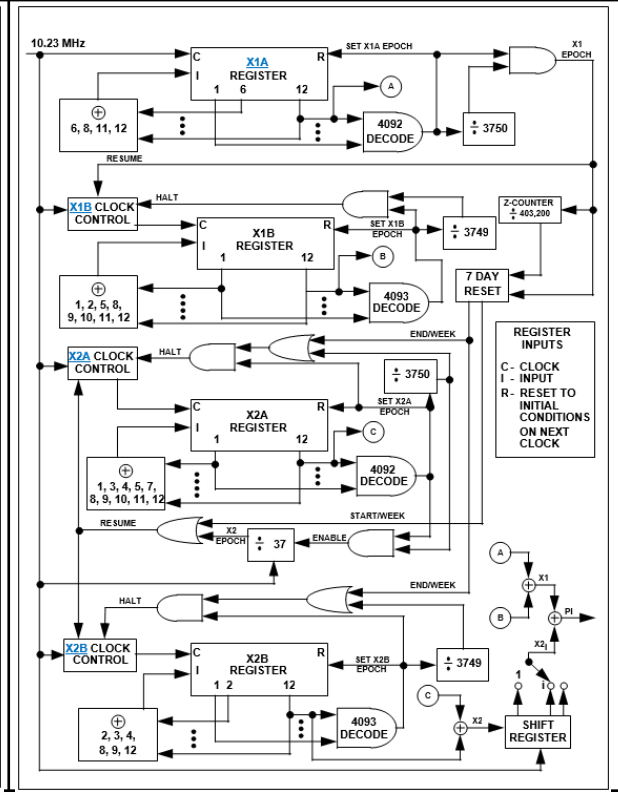
***** Relative to following reference values:

$e = 0$

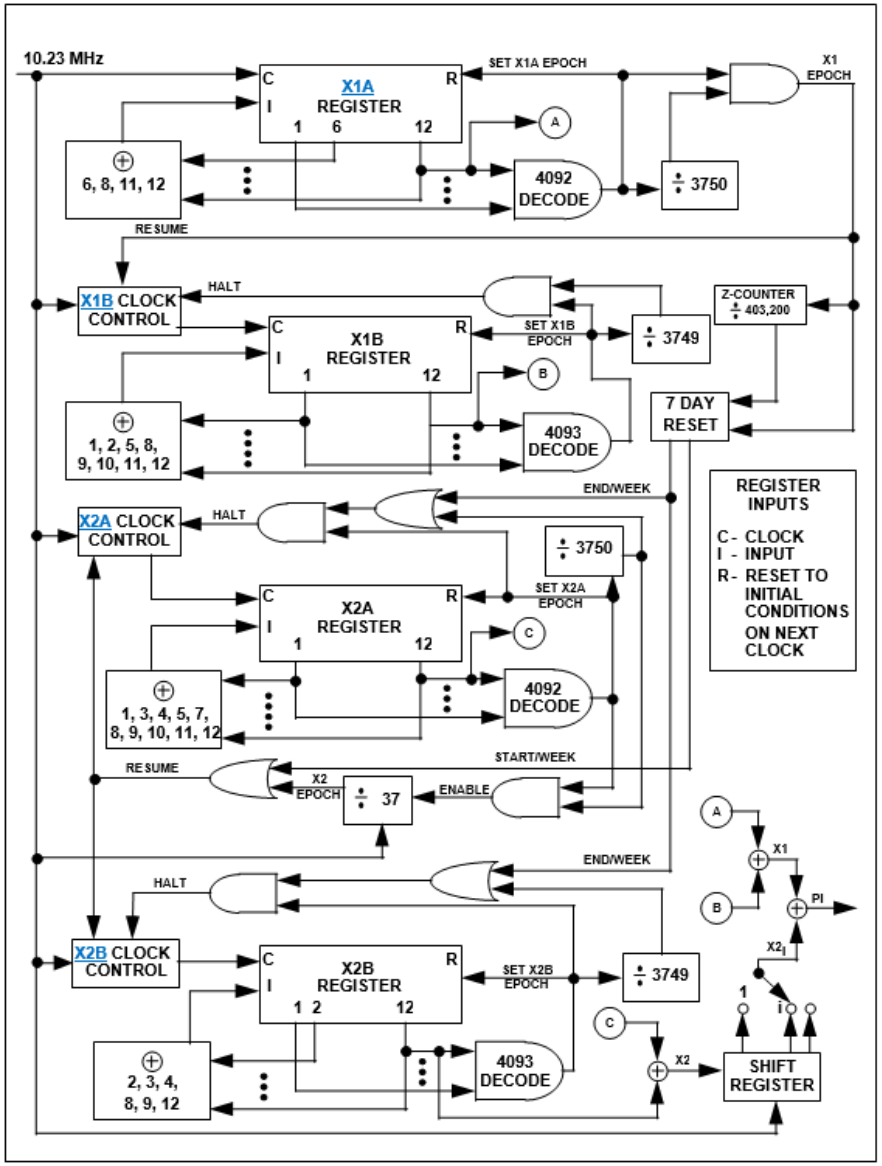
δ_i = +0.0056 semi-circles (i = 55 degrees)

$\dot{\Omega}$ =-2.6 x 10^{-9} semi-circles/second

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-118
Paragraph	3.3.2.2 (Figure 3-6)	**Comment Number**	50
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	Ron Dixon (Boeing IIF LOOS)		
Comment	Figure still needs cleaning up: - Text cut off in 'X1B CLOCK CONTROL', 'X2A CLOCK CONTROL' and 'X2B CLOCK CONTROL' boxes - Text overlays box boundary in 'X1A REGISTER' box (see 'X1B REGISTER' box for how it should look)		
Directorate Response	For clarity. Produce a new figure.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
		N/A

PIRN Text (IS) IS200-118



Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-338
Paragraph	20.3.3.3.3.0-2	**Comment Number**	52
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Ron Dixon (Boeing IIF LOOS)		
Comment	The phrase 'extraordinary circumstances' was added to the footnote of the table and is undefined in this context. This makes it impossible to determine when invalid values may be broadcast. Suggest rejecting the change. If some SF1 parameters can indeed contain invalid values, the conditions that would cause this should be fully presented in the text of the document; not in a table footnote.		
Directorate Response	The original proposed change (additional footnote) to this DOORS ID is now OBE. The newly proposed change (clarification of the Valid Range definition) is now in IS200-1508.		

BASELINE TEXT (WAS)

Table 20-I. Subframe 1 Parameters

Parameter	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
Code on L2	2	1		(see text)
Week No.	10	1		week
L2 P data flag	1	1		discrete
SV accuracy	4			(see text)
SV health	6	1		discretes
T_{GD}	8*	2^{-31}		seconds
IODC	10			(see text)
t_{oc}	16	2^{4}	0 to 604,784	seconds
a_{f2}	8*	2^{-55}		sec/sec^2
a_{f1}	16*	2^{-43}		sec/sec
a_{f0}	22*	2^{-31}		seconds

* Parameters so indicated shall be two's complement, with the sign bit (+ or -) occupying the MSB;

** See Figure 20-1 for complete bit allocation in subframe;

*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.

PIRN TEXT (IS) (in the original PIRN)

Table 20-I. Subframe 1 Parameters

Parameter	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
Code on L2	2	1		discretes
Week No.	10	1		week
L2 P data flag	1	1		discrete
SV accuracy	4			(see text)
SV health	6	1		discretes
T_{GD}	8*	2^{-31}		seconds
IODC	10			(see text)
t_{oc}	16	2^{4}	0 to 604,784	seconds
a_{f2}	8*	2^{-55}		sec/sec^2
a_{f1}	16*	2^{-43}		sec/sec
a_{f0}	22*	2^{-31}		seconds

* Parameters so indicated shall be two's complement, with the sign bit (+ or -) occupying the MSB;

** See Figure 20-1 for complete bit allocation in subframe;

*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor. Identifies the ordinary range of values broadcast by GPS. In extraordinary circumstances, invalid values may be broadcast. The valid ranges are only for PRNs 1-63.

PROPOSED TEXT

OBE for IS200-338.

New proposed change is made as IS200-1508 as noted in Comment 75.

PIRN Text IS200-338

Table 20-I. Subframe 1 Parameters

Parameter	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
Code on L2	2	1		discretes
Week No.	10	1		week
L2 P data flag	1	1		discrete
SV accuracy	4			(see text)
SV health	6	1		discretes
T_{GD}	8*	2^{-31}		seconds
IODC	10			(see text)
t_{oc}	16	2^{4}	0 to 604,784	seconds
a_{f2}	8*	2^{-55}		sec/sec^2
a_{f1}	16*	2^{-43}		sec/sec
a_{f0}	22*	2^{-31}		seconds

* Parameters so indicated shall be two's complement, with the sign bit (+ or -) occupying the MSB;

** See Figure 20-1 for complete bit allocation in subframe;

*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor. Identifies the ordinary range of values broadcast by GPS. In extraordinary circumstances, invalid values may be broadcast. The valid ranges are only for PRNs 1-63.

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-1491
Paragraph	30.3.3.4.6.1	**Comment Number**	53
Comment Type	Substantive	**Disposition**	Reject
Comment Originator(s)	Ron Dixon (Boeing IIF LOOS)		
Comment	The IS wording is not much better than the WAS wording. It is ambiguous. The Reduced Almanac Packets are 31 bits. Therefore, when the new IS wording states that all subsequent bits to the end of the message shall be filler bits, is this on a packet basis or an entire message basis? The former would have each packet begin with a one bit. The latter would have packets alternating between beginning with a one bit and a zero bit. I think each packet should begin with a one bit (not for any technical reason, I just think it's cleaner).		
Directorate Response	Consensus at the Non-Government Public ICWG on 24 August, 2016.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
A 6-bit value of "000000" in the PRN_a field shall indicate that no further Status Words are contained in the remainder of the data block. In this event, all subsequent bits in the data block field shall be filler bits, i.e., alternating ones and zeros beginning with one.	A 6-bit value of "000000" in the PRN_a field shall indicate that ~~no further Status~~ there ~~Words~~ is ~~are~~ no ~~contained~~ data in the ~~remainder of the~~ reduced ~~data~~ almanac ~~block~~ packet. In this event, all subsequent bits ~~in~~ to the ~~data~~ end ~~block~~ of ~~field~~ the message that contains the packet shall be filler bits, i.e., alternating ones and zeros beginning with one.	A 6-bit value of "000000" in the PRN_a field shall indicate that there is no data in the reduced almanac packet. In this event, all subsequent bits to the end of the ~~message that contains the~~ packet shall be filler bits, i.e., alternating ones and zeros beginning with one. Further, the entirety of each subsequent reduced almanac packet in the message shall also contain filler bits.

Affected Document(s)	IS-GPS-200	**DOORS ID**	N/A
Paragraph	N/A	**Comment Number**	63
Comment Type	Substantive	**Disposition**	Reject
Comment Originator(s)	Brent Renfro (ARL:UT)		
Comment	Add a Table 3-VIa that illustrates the P-code Reset Timing for the same period, but for a sample PRN. For example, PRN 5. The purpose is to illustrate how the reset timing works with the PRN delay included. As presented, NO PRN delay is included (PRN 0, if you will)		
Directorate Response	Proposed changes are now OBE.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	IS-GPS-200	**DOORS ID**	N/A
Paragraph	N/A	**Comment Number**	64
Comment Type	Substantive	**Disposition**	Reject
Comment Originator(s)	Brent Renfro (ARL:UT)		
Comment	Add a Table 3-VIIa that illustrates the final code vector states including a PRN delay. This allows a multi-chip verification that a given implementation is correctly handling the X2 register delays associated with the PRN delay in addition to those associated with the X1/X2 precession.		
Directorate Response	Proposed changes are now OBE.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	IS-GPS-200	**DOORS ID**	IS200-422
Paragraph	20.3.3.5.1.9	**Comment Number**	66
Comment Type	Substantive	**Disposition**	Defer
Comment Originator(s)	Rockwell Collins		
Comment	Contents of Navigation Message Correction Table (NMCT) data broadcast in Subframe 4 Page 13 by PRN 32 are not defined. NMCT data contains slots for estimated range deviations (ERDs) for 30 SVs -- all SVs except for the transmitting PRN and for PRN 32. Current broadcast appears to indicate that alternating ones and zeros are broadcast by PRN 32. Clarify that NMCT data broadcast by PRN 32 in Subframe 4 Page 13 is filled with alternating ones and zeros, and the availability indicator is set to '10', indicating "no correction table available“		
Directorate Response	This comment is not directly against RFC-318’s proposed changes. We will track this comment and submit a formal concern against it in eGPS to be resolved during the 2017 Public ICWG.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	IS-GPS-800	**DOORS ID**	IS800-159, 160, 161
Paragraph	3.5.3 Subframe 2 (Table 3.5-1 page 1, 2 & 3)	**Comment Number**	68
Comment Type	Substantive	**Disposition**	Reject
Comment Originator(s)	Steven Brown (GPS III/ LM)		
Comment	To align with the change from "effective range" to "valid range", suggest updating the *** note as well to not state "maximum".		
Directorate Response	The term "maximum" is not incorrect for the intended definition of valid range. (If we decide to remove the word maximum, 30+ tables in three public documents will be affected. The scope of the change doesn't warrant the amount of work required to implement this change)		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
(N/A: This change was not included in the original PIRN submitted for review) *** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.	(N/A: This change was not included in the original PIRN submitted for review)	*** Unless otherwise indicated in this column, valid range is the ~~maximum~~ range attainable with indicated bit allocation and scale factor. OR: *** Unless otherwise indicated in this column, valid range is the ~~maximum~~ full range attainable with indicated bit allocation and scale factor.

Affected Document(s)	IS-GPS-800	**DOORS ID**	IS800-894
Paragraph	3.5.4.3.5.1.1, Reduced Almanac	**Comment Number**	69
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	Steven Brown (GPS III/ LM)		
Comment	Proposed text slightly confusing…please rephrase, something along the lines of the Recommended Resolution.		
Directorate Response	Updated text to be more specific.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
A 8-bit value of “000000” in the PRN_a field shall indicate that no further Status Words are contained in the remainder of the data block. In this event, all subsequent bits in the data block field shall be filler bits, i.e., alternating ones and zeros beginning with one.	A 8-bit value of “000000” in the PRN_a field shall indicate that ~~no further Status~~ there ~~Words~~ is ~~are~~ no ~~contained~~ data in the ~~remainder of the~~ reduced ~~data~~ almanac ~~block~~ packet. In this event, all subsequent bits ~~in~~ to the ~~data~~ end ~~block~~ of ~~field~~ the message that contains the packet shall be filler bits, i.e., alternating ones and zeros beginning with one.	An 8-bit value of “00000000” in the PRNa field shall indicate that there is no data in the reduced almanac packet. In this event, all ~~subsequent~~ bits following the zero PRNa field to the end of the ~~message that contains the packet~~ Subframe 3 Page 3 message shall be filler bits, i.e., alternating ones and zeros, beginning with one.

Affected Document(s)	IS-GPS-800	**DOORS ID**	IS800-872
Paragraph	3.5.5.3 (IS-GPS-800)	**Comment Number**	70
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Steven Brown (GPS III/ LM)		
Comment	Why is CNAV being reference in IS800 and not CNAV2?		
Directorate Response	Section 3.5.5.3 in IS-GPS-800 referred to Section 30.3.4.5 in IS-GPS-200 but failed to specify that the CNAV-2 reference time information is similar to that of the CNAV excluding the toc reference. Recommend that we add the statement above for clarification. WAS: 3.5.5.3 Reference Times: The CNAV reference time information may be found in paragraph 30.3.4.5 in IS-GPS-200. IS: 3.5.5.3 Reference Times: The CNAV-2 reference time information is similar to that of the CNAV excluding the toc reference. The CNAV reference time information may be found in paragraph 30.3.4.5 in IS-GPS-200.		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
(N/A: This change was not included in the original PIRN submitted for review) This is the baseline text in IS-GPS-800: 3.5.5.3 Reference Times: The CNAV reference time information may be found in paragraph 30.3.4.5 in IS-GPS-200.	(N/A: This change was not included in the original PIRN submitted for review)	Recommend to change to: 3.5.5.3 Reference Times: The CNAV-2 reference time information is similar to that of the CNAV excluding the toc reference. The CNAV reference time information may be found in paragraph 30.3.4.5 in IS-GPS-200.

Affected Document(s)	IS-GPS-705	**DOORS ID**	IS705-332
Paragraph	Table 20-IX UTC Parameters	**Comment Number**	71
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	Steven Brown (GPS III/ LM)		
Comment	RFC-318 fails to build on top of RFC-288 version of table so you are going to lose/regress previously-agreed upon changes. The only difference between RFC-288 version of this table and RFC-318 version of this table should be the number of bits for the WN_LSF parameter going from 8 bits to 13 bits. All other RFC-288 changes need to be added into the RFC-318 "is" text to ensure nothing gets dropped.		
Directorate Response	RFC-288 was CCB approved 7/29/2016. We used the wording in RFC-288 as the "WAS" and make changes to these applicable texts as the proposed "IS". Revisited the other tables which were impacted by both RFC-288 and RFC-318		

BASELINE TEXT (WAS)

Table 20-IX. UTC Parameters

Parameter Symbol	Parameter Description	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0-n}	Bias coefficient of GPS time scale relative to UTC time scale	16*	2^{-35}		Seconds
A_{1-n}	Drift coefficient of GPS time scale relative to UTC time scale	13*	2^{-51}		sec/sec
A_{2-n}	Drift rate correction coefficient of GPS time scale relative of UTC time scale	7*	2^{-68}		sec/sec^2
Δt_{LS}	Current or past leap second count	8*	1		seconds
t_{ot}	Time data reference Time of Week	16	2^4	0 to 604,784	seconds
WN_{ot}	Time data reference Week Number	13	1		weeks
WN_{LSF}	Leap second reference Week Number	8	1		weeks
DN	Leap second reference Day Number	4	1	1 to 7	days
Δt_{LSF}	Current or future leap second count	8*	1		seconds

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;
** See Figure 20-6 for complete bit allocation
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.

PIRN TEXT (IS)

Table 20-IX. UTC Parameters

Parameter Symbol	Parameter Description	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0-n}	Bias coefficient of GPS time scale relative to UTC time scale	16*	2^{-35}		Seconds
A_{1-n}	Drift coefficient of GPS time scale relative to UTC time scale	13*	2^{-51}		sec/sec
A_{2-n}	Drift rate correction coefficient of GPS time scale relative of UTC time scale	7*	2^{-68}		sec/sec^2
Δt_{LS}	Current or past leap second count	8*	1		seconds
t_{ot}	Time data reference Time of Week	16	2^4	604,784	seconds
WN_{ot}	Time data reference Week Number	13	1		weeks
WN_{LSF}	Leap second reference Week Number	~~8~~ 13	1		weeks
DN	Leap second reference Day Number	4****	1		days
Δt_{LSF}	Current or future leap second count	8*	1		seconds

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;
** See Figure 20-6 for complete bit allocation
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor;
**** Right justified.

PROPOSED TEXT

Table 20-IX. UTC Parameters

Parameter Symbol	Parameter Description	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0-n}	Bias coefficient of GPS time scale relative to UTC time scale	16*	2^{-35}		Seconds
A_{1-n}	Drift coefficient of GPS time scale relative to UTC time scale	13*	2^{-51}		sec/sec
A_{2-n}	Drift rate correction coefficient of GPS time scale relative of UTC time scale	7*	2^{-68}		sec/sec^2
Δt_{LS}	Current or past leap second count	8*	1		seconds
t_{ot}	Time data reference Time of Week	16	2^4	0 to 604,784	seconds
WN_{ot}	Time data reference Week Number	13	1		weeks
WN_{LSF}	Leap second reference Week Number	~~8~~ 13	1		weeks
DN	Leap second reference Day Number	4	1	1 to 7	days
Δt_{LSF}	Current or future leap second count	8*	1		seconds

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;
** See Figure 20-6 for complete bit allocation
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor;
**** Right justified.

Proposed Text IS705-332

Table 20-IX. UTC Parameters

Parameter Symbol	Parameter Description	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A_{0-n}	Bias coefficient of GPS time scale relative to UTC time scale	16*	2^{-35}		Seconds
A_{1-n}	Drift coefficient of GPS time scale relative to UTC time scale	13*	2^{-51}		sec/sec
A_{2-n}	Drift rate correction coefficient of GPS time scale relative of UTC time scale	7*	2^{-68}		sec/sec^2
Δt_{LS}	Current or past leap second count	8*	1		seconds
t_{ot}	Time data reference Time of Week	16	2^4	0 to 604,784	seconds
WN_{ot}	Time data reference Week Number	13	1		weeks
WN_{LSF}	Leap second reference Week Number	~~8~~ 13	1		weeks
DN	Leap second reference Day Number	4	1	1 to 7	days
Δt_{LSF}	Current or future leap second count	8*	1		seconds

* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;
** See Figure 20-6 for complete bit allocation
*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor;
**** Right justified.

Affected Document(s)	IS-GPS-800	**DOORS ID**	IS800-682 *(DOORS ID is actually IS800-260)*
Paragraph	3.5.4.3.5.1.1 Reduced Almanac	**Comment Number**	74
Comment Type	Substantive	**Disposition**	Accept with Comments
Comment Originator(s)	Steven Brown (GPS III/ LM)		
Comment	Consider removing the five asterisk annotation from the "Parameter" column for consistency with IS200 Table 30-VI and the RFC-318 update to IS705 Table 20-VI.		
Directorate Response	Consistency. Remove the five asterisk annotation from the "Parameter" column for consistency in Table 3.5-6, Reduced Almanac Parameters (DOORS ID is actually IS800-260)		

BASELINE TEXT (WAS)

Table 3.5-6. Reduced Almanac Parameters *****

Parameter*****	No. of Bits	Scale Factor (LSB)	Effective Range **	Units
δ_A ***	8 *	2^{-9}	**	Meters
Ω_0	7 *	2^{-6}	**	semi-circles
Φ_0 ****	7 *	2^{-6}	**	semi-circles

* Parameters so indicated shall be in two's complement notation;
** Effective range is the maximum range attainable with indicated bit allocation and scale factor;
*** Relative to A_{ref} = 26,559,710 meters;
**** Φ_0 = Argument of Latitude at Reference Time = $M_0 + \omega$;
***** Relative to following reference values:

e = 0
δ_i = +0.0056 semi-circles (i = 55 degrees)
$\dot{\Omega}$ =-2.6 x 10^{-9} semi-circles/second

PIRN TEXT (IS)

IS :

Table 3.5-6. Reduced Almanac Parameters *****

Parameter*****	No. of Bits	Scale Factor (LSB)	Valid Range **	Units
δ_A ***	8 *	2^{-9}	**	Meters
Ω_0	7 *	2^{-6}	**	semi-circles
Φ_0 ***	7 *	2^{-6}	**	semi-circles
*				

* Parameters so indicated shall be in two's complement notation;
** Valid range is the maximum range attainable with indicated bit allocation and scale factor;
*** Relative to A_{ref} = 26,559,710 meters;
**** Φ_0 = Argument of Latitude at Reference Time = $M_0 + \omega$;
***** Relative to following reference values:

e = 0
δ_i = +0.0056 semi-circles (i = 55 degrees)
$\dot{\Omega}$ =-2.6 x 10^{-9} semi-circles/second

PROPOSED TEXT

IS :

Table 3.5-6. Reduced Almanac Parameters *****

Parameter*****	No. of Bits	Scale Factor (LSB)	Valid Range **	Units
δ_A ***	8 *	2^{-9}	**	Meters
Ω_0	7 *	2^{-6}	**	semi-circles
Φ_0 ***	7 *	2^{-6}	**	semi-circles
*				

* Parameters so indicated shall be in two's complement notation;
** Valid range is the maximum range attainable with indicated bit allocation and scale factor;
*** Relative to A_{ref} = 26,559,710 meters;
**** Φ_0 = Argument of Latitude at Reference Time = $M_0 + \omega$;
***** Relative to following reference values:

e = 0
δ_i = +0.0056 semi-circles (i = 55 degrees)
$\dot{\Omega}$ =-2.6 x 10^{-9} semi-circles/second

Proposed Text IS800-682

IS :

Table 3.5-6. Reduced Almanac Parameters *****

Parameter*****	No. of Bits	Scale Factor (LSB)	Valid Range **	Units
δ_A ***	8 *	2^{-9}	**	Meters
Ω_0	7 *	2^{-6}	**	semi-circles
Φ_0 ***	7 *	2^{-6}	**	semi-circles
*				

* Parameters so indicated shall be in two's complement notation;

** Valid range is the maximum range attainable with indicated bit allocation and scale factor;

*** Relative to $A_{ref} = 26{,}559{,}710$ meters;

**** Φ_0 = Argument of Latitude at Reference Time = $M_0 + \omega$;

***** Relative to following reference values:

$e = 0$

$\delta_i = +0.0056$ semi-circles $(i = 55$ degrees$)$

$\dot{\Omega} = -2.6 \times 10^{-9}$ semi-circles/second

Affected Document(s)	IS-GPS-705	**DOORS ID**	IS705-1518; IS705-1519
Paragraph	(New) 6.3.5 Pre-Operational Use:	**Comment Number**	78
Comment Type	Substantive	**Disposition**	Accept
Comment Originator(s)	Stephan Hillman (SMC/GPGX)		
Comment	The paragraph requested in Action Item 1532 does not appear in the PIRN.		
Directorate Response	The change was inadvertently left out. Add a new section, 6.3.5 Pre-Operational Use, right after Section 6.3.4 Additional PRN Sequences		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
(N/A: The proposed change was inadvertently left out in the original PIRN submitted for review)	(N/A: The proposed change was inadvertently left out in the original PIRN submitted for review. This is a new section to be added to IS-GPS-705)	6.3.5 Pre-Operational Use: Before any new signal or group of signals (e.g., L2C, L5, M, L1C, etcetera) is declared operational, the availability of and/or the configuration of the broadcast signal or group of signals may not comply with all requirements of the relevant IS or ICD. For example, the pre-operational broadcast of L2C signals from the IIR-M satellites did not include any NAV or CNAV data as required by IS-GPS-200. Pre-operational use of any new signal or group of signals is at the users own risk.

Critical Comments

Substantive Comments

Rejected Administrative Comments (2)

Affected Document(s)	IS-GPS-200	**DOORS ID**	*Table 30-VI*
Paragraph	IS-GPS-200, Table 30-VI	**Comment Number**	81
Comment Type	Administrative	**Disposition**	Reject
Comment Originator(s)	Stephan Hillman (SMC/GPGX)		
Comment	Why wasn't this table updated to replace Effective Range with Valid Range, as done elsewhere in this RFC?		
Directorate Response	This table is updated in IRN-IS-200H-003 of RFC-288 (CCB approved 7/29/2016)		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

Affected Document(s)	N/A	**DOORS ID**	N/A
Paragraph	IS-GPS-200, Pre-RFC Issue 583	**Comment Number**	82
Comment Type	Administrative	**Disposition**	Reject
Comment Originator(s)	Stephan Hillman (SMC/GPGX)		
Comment	This does not appear to have been implemented in the PIRN. If it is in the PIRN, in which object was the change made?		
Directorate Response	Changes already made to: IS200-1286 IS200-97 IS200-1282		

BASELINE TEXT (WAS)	PIRN TEXT (IS)	PROPOSED TEXT
N/A	N/A	N/A

REVIEW OF 2015 PUBLIC CRM

CRM: Comment Resolution Matrix

Pauline Bennett

Status Summary

Status	Quantity		
	2014	2015	2016
Complete	22	14	0
In Progress	1	3	2
Pending Action	0	6	0
Not Started	0	0	0
Total	23	23	2

ACTION ITEM REVIEW

CLOSING COMMENTS

THANK YOU

The meeting will reconvene tomorrow at 0830 hrs PDT.

Global Positioning Systems (GPS) Public Interface Control Working Group and Public Forum

21-22 September 2016
0830 – 1630 hrs PST

United States Air Force GPS Directorate
Phone Number: 1-310-653-2663 Meeting ID: 6272252 Passcode: 000001
DCS Website: https://conference.apps.mil/webconf/2016PICWG

Roll Call

Rules of Engagement

UNCLASSIFIED

ABSOLUTELY NO PROPRIETARY, CLASSIFIED, OR COMPETITION SENSITIVE INFORMATION IS TO BE DISCUSSED DURING THIS MEETING.

Rules of Engagement

- Please place your phones on mute when not speaking to minimize background noise
- Comments against the topics listed on the official agenda will get priority during discussion, all others will be addressed during the open discussion
- Topics that warrant additional discussion may be side-barred
- Meeting minutes and final IRNs will be generated and distributed as a product of this meeting
- Please announce your name and organization before addressing the group

Meeting Purpose

- The purpose of the meeting is to:

1) Obtain ICWG approval on the proposed language generated for the enterprise RFCs that may impact the public documents

2) Discuss any new open forum items against the Public Signals in Space documents

Comments received will be vetted per the standard change management process

Agenda – Day 1 (Public ICWG)

Opening Remarks

Roll Call

Agenda Overview

Meeting Logistics / Rules of Engagement

Meeting Purpose

ICWG Presentations

- Request for Change (RFC) 308: Update Interface Control Document (ICD)-GPS-870 and Interface Control Document (ICD)-GPS-240

- Request for Change (RFC) 312: Definition Clarification for Time of Predict

- Request for Change (RFC) 318: 2016 Public Document Clean-Up

- Review of 2015 Comment Resolution Matrix

Action Item Review

Adjourn

Agenda – Day 2 (Public Forum)

Reconvene

Roll Call

Special Topic Presentations

- Appendix D to the Standard Positioning Service (SPS) Performance Standard (PS)
- Release of Receiver Independent Exchange Format (RINEX) Data from Control Segment to Civil Users
- Message Type 38
- Carrier Phase Noise via 3rd Order Jaffe-Rechtin Phase-locked loop (PLL)
- Operational Advisories
- How a Change in Interface Specification (IS)-GPS-705 and Interface Specification (IS)-GPS-800 Could Save Lives
- GPS Technical Baseline Overhaul *(Tentative)*

Open Discussion Session

Action Item Review

Adjourn

2016 PUBLIC FORUM

APPENDIX D TO THE SPS PS

SPS: Standard Positioning Service
PS: Performance Specification

K. Kovach (GPE/Aerospace)

Information Only:
SPS PS Update

Karl Kovach, SMC/GPE(Aero)

Public Interface Control Working Group (PICWG)
21-22 September 2016

Overview - I

- **Adding L2C and L5**
  - *Objective: Include Performance Standard commitments on L2C and L5 signals*
    - Additions for signal ‘coverage’, accuracy’, and ‘integrity’
    - Not ready to commit to ‘continuity’ or ‘availability’

- **Adding P_{const} and P_{sat}**
  - *Objective: Include considerations to support ARAIM and multi-constellation operations*
    - Additions for signal ‘coverage’, accuracy’, and ‘integrity’

Special acknowledgement: 1Lt D. Besson of GPE

Overview - II

- **Resiliency Appendix (Appendix D)**
  - *Objective: Include civil receiver development best practices for processing the signal in space to increase resiliency and avoid SiS incompatibility*
    - Topics listed on following slides
    - Include recommendations for civil developers similar to RSAM requirements (only use valid data as defined by IS-GPS 200)
  - *Driving Actions*
    - Action from NPEF, prompted by UTCO anomaly of 25-26 Jan 16
    - Supports other interagency objectives as well (e.g., FAA GIISST Report recommendations)

Appendix D Context

- **Appendix D – "Resiliency Considerations" (Best Practices)**
  - *Not requirements per se*
    - Verb is "should", not "must"
  - *Think of as 'mandatory caveats'*
    - If want to take advantage of SPS PS "SIS performance guarantees"
      - *Then must comply with Appendix D recommendations*
    - If don't care about SPS PS "SIS performance guarantees"
      - *Then should comply with Appendix D recommendations*
  - *Appendix D is a 'carrot', not a 'stick'*

Appendix D Contents & Status as of 4 Jul 16

Topic	Lead Author	Status
UTCO Validity	Kovach	Final Draft
Week Number rollovers	Kovach	In work
Almanac	Suprin	Final Draft
Data set cutover	Renfro	Final Draft
Extended NAV (Block II SVs Only)	Kovach	Final Draft
WAGE-2	Kovach	Postponed
URA processing in CNAV	Renfro	Final Draft
Known good NAV messages	Suprin	Final Draft
Higher PRNs (PRNs 33-63)	Kovach	Final Draft
Ephemeris/almanac cross checks	Renfro	Final Draft
Military use of L1 C/A, L2C, L5	Kovach	Postponed
When to use CNAV/ versus LNAV	Renfro	Final Draft
Reserved data in subframes 1&4	Suprin	Final Draft
Single Frequency Ionospheric Model Validity	Kovach	In Work
Appendix introduction and table of contents	Besson	In Work
Leap Second Validity	Powers	In Work
GGTO Validity	Powers	In Work
EOP Validity	Powers	In Work
IODE/IODC	Kovach	In Work
Unexpected CNAV Messages	Kovach	In Work
Pseudorange Step Detection	Kovach	In Work

Appendix D Contents & Status as of 4 Jul 16

Sample to look at

Topic	Lead Author	Status
UTCO Validity	Kovach	Final Draft
Week Number rollovers	Kovach	In work
Almanac	Suprin	Final Draft
Data set cutover	Renfro	Final Draft
Extended NAV (Block II SVs Only)	Kovach	Final Draft
WAGE-2	Kovach	Postponed
URA processing in CNAV	Renfro	Final Draft
Known good NAV messages	Suprin	Final Draft
Higher PRNs (PRNs 33-63)	Kovach	Final Draft
Ephemeris/almanac cross checks	Renfro	Final Draft
Military use of L1 C/A, L2C, L5	Kovach	Postponed
When to use CNAV/ versus LNAV	Renfro	Final Draft
Reserved data in subframes 1&4	Suprin	Final Draft
Single Frequency Ionospheric Model Validity	Kovach	In Work
Appendix introduction and table of contents	Besson	In Work
Leap Second Validity	Powers	In Work
GGTO Validity	Powers	In Work
EOP Validity	Powers	In Work
IODE/IODC	Kovach	In Work
Unexpected CNAV Messages	Kovach	In Work
Pseudorange Step Detection	Kovach	In Work

Recommendation

- **The PICWG is invited to consider the provided information and comment as appropriate.**

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Assuring Space Mission Success

Thank You

Resilience Considerations for UTC Offset

DRAFT

K^3 = Vb: 22 Jun 16

STANDARD POSITIONING SERVICE (SPS) PERFORMANCE STANDARD (PS)

APPENDIX D

RESILIENCY CONSIDERATIONS

D.xx RESILIENCE CONSIDERATIONS FOR UTC OFFSET (UTCO) INFORMATION

D.xx.1 Definitions

SF4, P18	Subframe 4 Page 18 of the LNAV message. Contains a set of four UTCO parameters (WN_t, t_{ot}, A_0, and A_1), among other parameters.
UTCO Data Quartet	The set of four UTCO parameters (WN_t, t_{ot}, A_0, and A_1) in Subframe 4 Page 18 of the LNAV message.
MT-33	Message Type 33 of the CNAV message. Contains a set of five UTCO parameters (WN_t, t_{ot}, A_0, A_1, and A_2), among other parameters.
UTCO Data Quintet	The set of five UTCO parameters (WN_t, t_{ot}, A_0, A_1, and A_2) in Message Type 33 of the CNAV message.
UTCO Data Reference Time	The reference time for the UTCO data quartet and UTCO data quintet; the point in t_{GPS} represented by the properly resolved (untruncated and rollover accounted) WN_t and t_{ot} parameters.
UTCO Data Reference Epoch	Same as UTCO Data Reference Time.
t_{UTCO}	Equivalent to UTCO Data Reference Time and UTCO Data Reference Epoch, expressed as time since the GPS epoch (e.g., seconds since the UTC(USNO) Saturday night/Sunday morning transition on 5/6 January 1980).
t_{GPS}	GPS time, expressed as time since the GPS epoch (e.g., seconds since the UTC(USNO) Saturday night/Sunday morning transition on 5/6 January 1980).
t	GPS receiver's estimate of current GPS time, expressed as time since the GPS epoch (e.g., seconds since the UTC(USNO) Saturday night/Sunday morning transition on 5/6 January 1980).
t_E	GPS receiver's estimate of current GPS time of week (TOW), ignoring the week number (WN).

DRAFT

AEROSPACE

RINEX DATA FROM CONTROL SEGMENT

RINEX: Receiver Independent Exchange Format

K. Kovach (GPE/Aerospace)

Output of RINEX Data; ICD-GPS-240A/870B

Karl Kovach, SMC/GPE(Aero)

Public Interface Control Working Group (PICWG)
21-22 September 2016

Overview

- **Think 'Big Picture' Control Segment (BPCS)**
  - *Not just individual parts like MCS, MSs, GPSOC, etcetera*
    - Note title of -240A & -870B is "Navstar GPS Control Segment to User Support Community Interfaces"
- **NGA precise ephemeris is part of BPCS**
  - *So is the data that goes into making the NGA precise ephemeris*
    - i.e., BPCS ensemble of Monitor Station (MS) observation data
- **BPCS can (should) provide MS observation data to the world**
  - *What a "Gold Standard' BPCS would do*
  - *Pre-existing mechanism for sharing MS observation data*
    - International GNSS Service (IGS) – network with 497 MSs as of 12 Aug 16
    - Very well-standardized format for sharing MS observation data:
      - *"Receiver Independent Exchange Format" (RINEX)*

Special acknowledgement: T. Kawakami

GPS Classification/Declassification Guide

ITEM	TOPIC	CLASS
⋮	⋮	⋮
J5.10.1.1.4.2 (formerly 1901.1.4.2)	(U) Raw SV to receiving equipment ranging data	U
⋮	⋮	⋮
J5.10.1.1.4.5 (formerly 1901.1.4.5)	(U) *Broadcast ephemerides* or broadcast clock (i.e. uncorrected ephemeris).	U
⋮	⋮	⋮

ICD-GPS-240A, Paragraph 2.2

Is Currently

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

None

Other Publications

None

Should Become

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

None

Other Publications

RINEX 14 Jul 15 The Receiver Independent Exchange Format, Version 3.03

ICD-GPS-240A, Table I

Is Currently

Table I Information Exchange Matrix					
Producer	**Consumer**	**Data Exchange Identification**	**Information Description**	**Nature of Transaction**	**Security**
GPS CS	GUSS Offline Software Tool	GPS Constellation Orbital and Performance Parameters	Almanac	Transfer via diskette	Unclassified
GPS CS	USCG NAVCEN	GPS Status Information	NANU	Transmit via E-Mail	Unclassified
GPS CS	USCG NAVCEN	GPS Constellation Status Summary	OA	Post to Internet Website	Unclassified
⋮	⋮	⋮	⋮	⋮	⋮
GPS CS	Military User Community	GPS Constellation Status Summary	OA	Post to Internet and SIPERNET Websites	Unclassified
GPS CS	Military User Community	GPS Constellation Orbital and Performance Parameters	Almanac	Post to Internet and SIPERNET Websites	Unclassified

Should Become

Table I Information Exchange Matrix					
Producer	**Consumer**	**Data Exchange Identification**	**Information Description**	**Nature of Transaction**	**Security**
GPS CS	GUSS Offline Software Tool	GPS Constellation Orbital and Performance Parameters	Almanac	Transfer via diskette	Unclassified
GPS CS	USCG NAVCEN	GPS Status Information	NANU	Transmit via E-Mail	Unclassified
GPS CS	USCG NAVCEN	GPS Constellation Status Summary	OA	Post to Internet Website	Unclassified
⋮	⋮	⋮	⋮	⋮	⋮
GPS CS	Military User Community	GPS Constellation Status Summary	OA	Post to Internet and SIPERNET Websites	Unclassified
GPS CS	Military User Community	GPS Constellation Orbital and Performance Parameters	Almanac	Post to Internet and SIPERNET Websites	Unclassified
GPS CS	GPS User Community	MS Observation Data	RINEX	Post to Internet Website	Unclassified

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ICD-GPS-240A, Paragraph 3.1

Is Currently

The information distributed by the CS includes Notice Advisory to Navstar Users (NANU), Operational Advisory (OA), and satellite almanac. The NANU is a message that informs users of satellite outages and other GPS issues. The OA is a descriptive summary of GPS constellation status. The satellite almanac contains orbital and performance parameters for operational GPS satellites. The primary means of data distribution include electronic mail (e-mail) and Internet and SIPRNET websites. All data transfer described in this ICD is unclassified.

Should Become

The information distributed by the CS includes Notice Advisory to Navstar Users (NANU), Operational Advisory (OA), ~~and~~ satellite almanac, and RINEX data. The NANU is a message that informs users of satellite outages and other GPS issues. The OA is a descriptive summary of GPS constellation status. The satellite almanac contains orbital and performance parameters for operational GPS satellites. The RINEX data contains monitor station (MS) observations. The primary means of data distribution include electronic mail (e-mail) and Internet and SIPRNET websites. All data transfer described in this ICD is unclassified.

ICD-GPS-240A, Paragraph 3.2

Is Currently

3.2 Interface Definitions

The following paragraphs define the physical interface between the CS and the Schriever AFB LAN on which the GUSS offline software tool resides. The following paragraphs also describe the functional interfaces between the CS and the GUSS tool, USCG NAVCEN, and the military user community.

Unless otherwise specified in the paragraphs below, e-mail used for data transfer is generated and transmitted using resources of the Schriever AFB LAN. Internet website hosting, uploads, and downloads are also accomplished using resources of the Schriever AFB LAN. SIPRNET website hosting, uploads, and downloads are accomplished using resources of the Peterson AFB LAN. The hardware and software interfaces of the internet and these LAN's are not controlled by this ICD. Therefore, these interfaces are described at the functional (application) level only in this ICD.

Should Become

3.2 Interface Definitions

The following paragraphs define the physical interface between the CS and the Schriever AFB LAN on which the GUSS offline software tool resides. The following paragraphs also describe the functional interfaces between the CS and the GUSS tool, USCG NAVCEN, ~~and~~ the military user community, and the GPS user community.

Unless otherwise specified in the paragraphs below, e-mail used for data transfer is generated and transmitted using resources of the Schriever AFB LAN. Internet website hosting, uploads, and downloads are also accomplished using resources of the Schriever AFB LAN or the National Geospatial Intelligence Agency (NGA). SIPRNET website hosting, uploads, and downloads are accomplished using resources of the Peterson AFB LAN. The hardware and software interfaces of the internet and these LAN's are not controlled by this ICD. Therefore, these interfaces are described at the functional (application) level only in this ICD.

ICD-GPS-240A, Paragraph 3.2.4 (new)

Is Currently

Should Become

3.2.4 Interfaces between the GPS CS and the IGS

The interface between the GPS CS and the IGS is shown in Figure 4.

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ICD-GPS-240A, Insert New Figure 4

- **Insert new Figure 4**

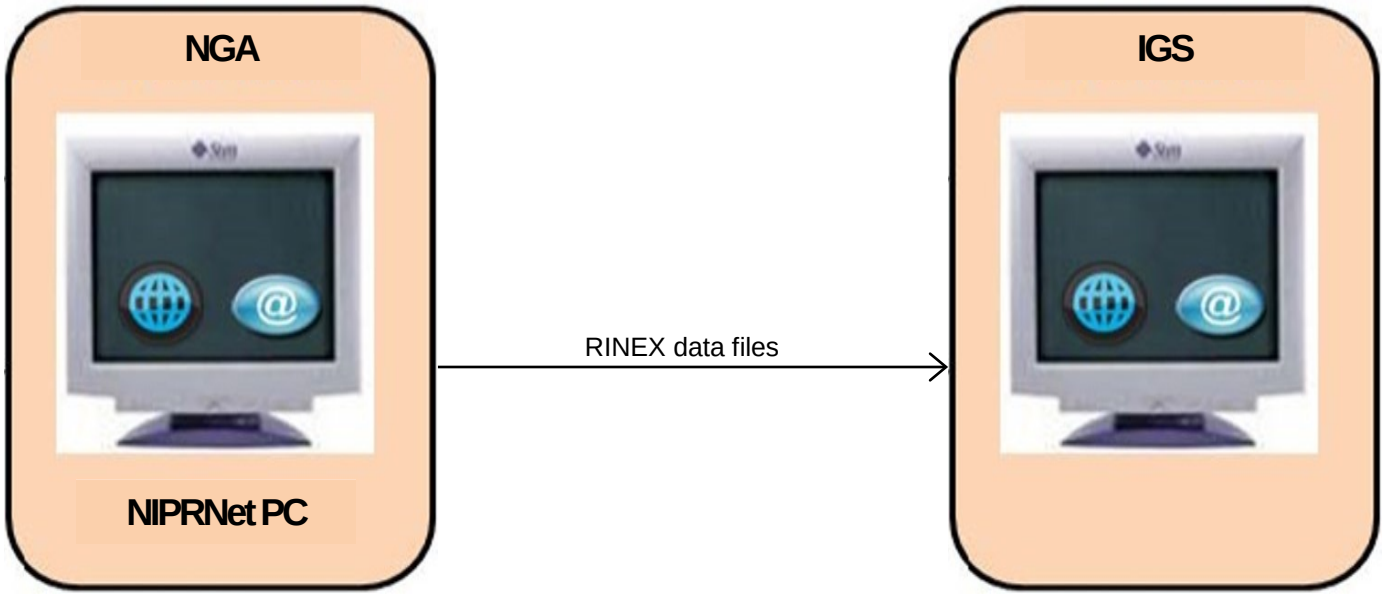

Figure 4 GPS CS to ICG Interface

ICD-GPS-240A, Paragraph 3.2.4.1 (new)

Is Currently

Should Become

3.2.4.1 IGS RINEX Interface

RINEX data transmitted to the IGS for subsequent access by the GPS user community include the following ASCII files defined in RINEX Version 3.03 as available (e.g., L5 MS data will not be available if the subject satellite is not transmitting L5 signals):

1. Observation data file
2. Navigation message file
3. Meteorological data file

See RINEX Version 3.03 for additional details.

ICD-GPS-240A, Paragraph 6.1

Is Currently

⋮	⋮
ICWG	Interface Control Working Group
ID	Identification
JDAY	Julian Day of the Year
⋮	⋮
NAV	Navigation
NAVCEN	Navigation Center
NC	No Change
OA	Operational Advisory
OCS	Operational Control System
⋮	⋮
POC	Point Of Contact
RB	Rubidium
s	Seconds
SEM	System Effectiveness Model
⋮	⋮

Should Become

⋮	⋮
ICWG	Interface Control Working Group
ID	Identification
IGS	International GNSS Service
JDAY	Julian Day of the Year
⋮	⋮
NAV	Navigation
NAVCEN	Navigation Center
NC	No Change
NGA	National Geospatial Intelligence Agency
OA	Operational Advisory
OCS	Operational Control System
⋮	⋮
POC	Point Of Contact
RB	Rubidium
RINEX	Receiver Independent Exchange Format
s	Seconds
SEM	System Effectiveness Model
⋮	⋮

ICD-GPS-870B Changes

- **BPCS does not change significantly with OCX**
  - *Architecturally, the MCS is still the MCS*
    - Details about MCS SW/HW are not important at this level
- **RINEX really is "Receiver Independent Exchange Format"**
  - *Observations independent of whether MSRE or OMSRE*
- **ICD-GPS-870B changes thus simply follow suit**

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Assuring Space Mission Success

Thank You

MESSAGE TYPE 38 (MT-38)

K. Kovach (GPE/Aerospace)

Integrity Support Messages (ISMs); MT-38 for CNAV & CNAV-2

Karl Kovach, SMC/GPE(Aero)

Public Interface Control Working Group (PICWG)
21-22 September 2016

Message Type 38 = Off-Line (Slow) ISM

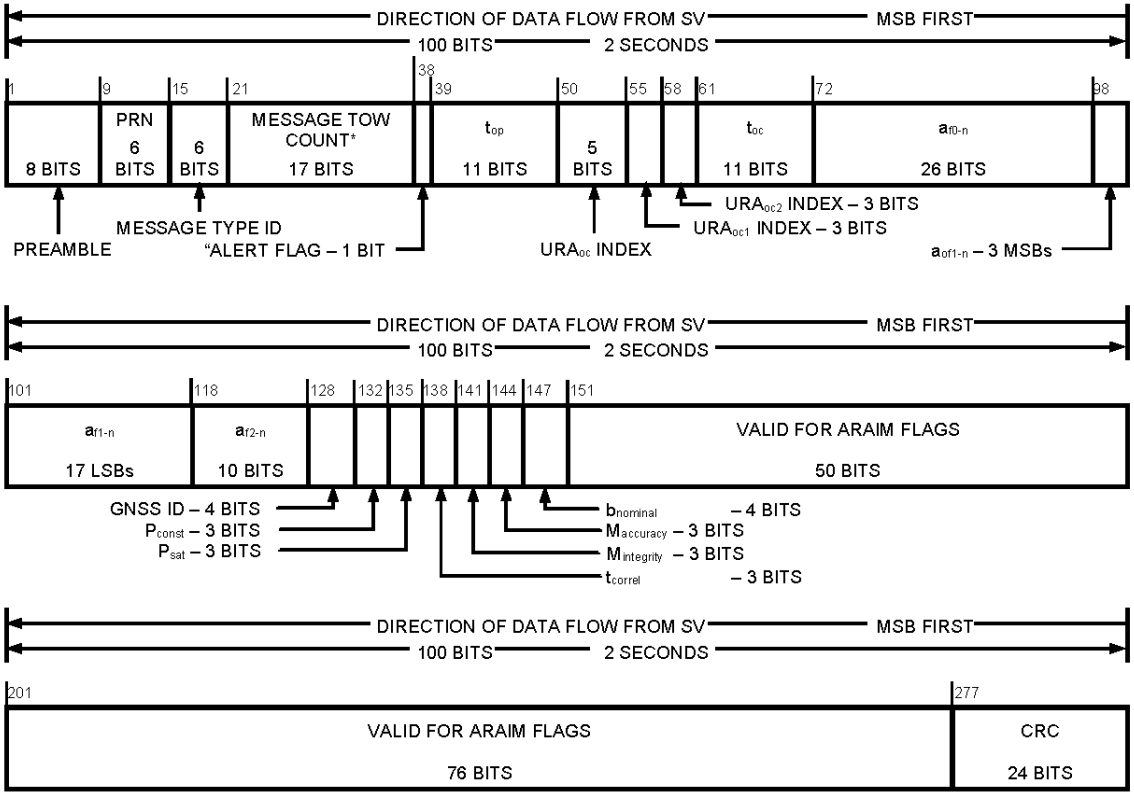
- **Technical references for Integrity Support Message (ISM):**
  - *GPS-Galileo Working Group C, ARAIM Technical Subgroup Interim Report, Feb 13*
  - *GPS-Galileo Working Group C, ARAIM Technical Subgroup Milestone 2 Report, Feb 15*
  - *GPS-Galileo Working Group C, ARAIM Technical Subgroup Milestone 3 Report, Feb 16*
- **U.S. personnel**
  - *Working Group C leadership: Mr. K. Alexander, FAA*
  - *Working Group C technical contact: Mr. J. Burns, FAA*
  - *ARAIM 'agent provocateur': Dr. P. Enge, Stanford University*
  - *Author & 'worker bee': Mr. K. Kovach, Aerospace Corp.*
- **Proposed Interface Revision Notices (PIRNs)**
  - *PIRNs for IS-GPS-705, IS-GPS-200, IS-GPS-800*
  - *Public ICWG scheduled for Sep 16*

Overview: ARAIM & Message Type 38

- **ARAIM is an advanced version of RAIM**
  - *RAIM = Receiver Autonomous Integrity Monitoring*

- **Message Type 38 Definition**
  - *Message Type 38 expected to be presented at PICWG in September*

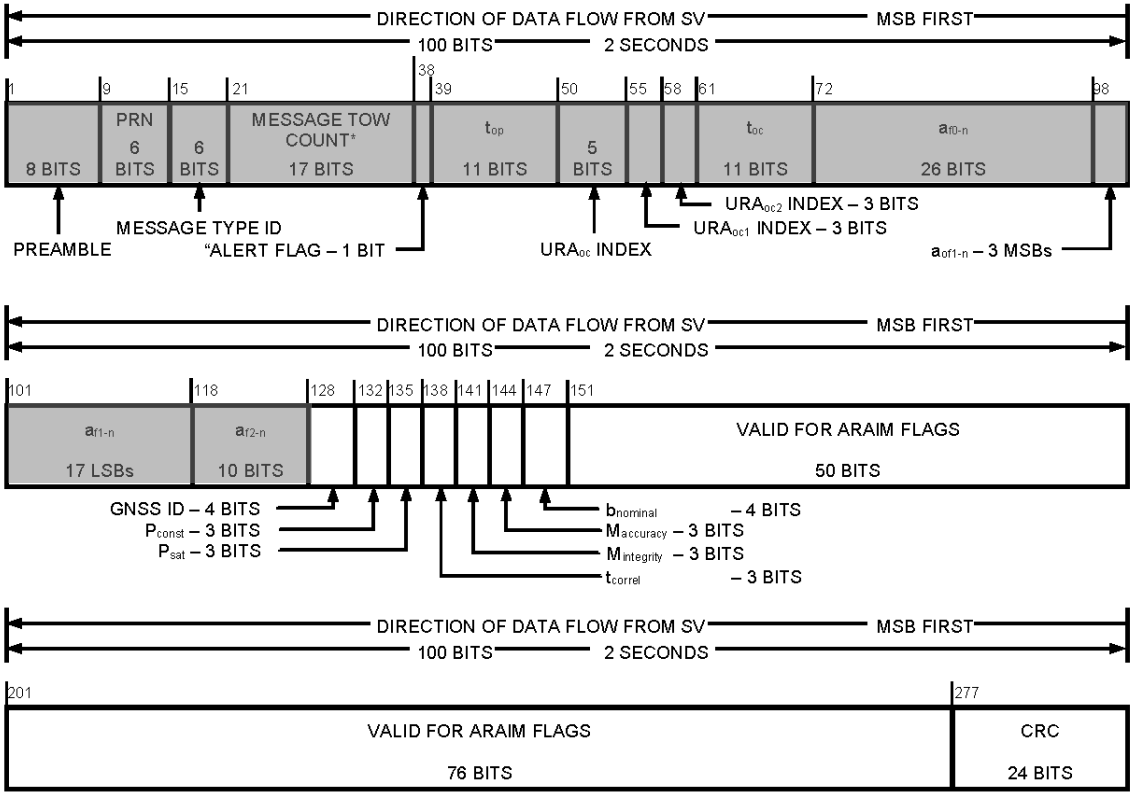
Message Type 38 = Off-Line (Slow) ISM



* MESSAGE TOW COUNT = 17 MSB OF ACTUAL TOW COUNT AT START OF NEXT 6-SECOND MESSAGE

Figure 20-15. Message Type 38 – Off-Line Integrity Support Message (ISM)

Message Type 38 = Off-Line (Slow) ISM



* MESSAGE TOW COUNT = 17 MSB OF ACTUAL TOW COUNT AT START OF NEXT 6-SECOND MESSAGE

Figure 20-15. Message Type 38 – Off-Line Integrity Support Message (ISM)

Message Type 38 = Off-Line (Slow) ISM

Table 20-XII. ISM Parameters

Parameter		No. of Bits**	Scale Factor (LSB)	Effective Range***	Units
GNSS ID	GNSS Constellation ID	4	1	8	see text
P_{const}	Probability of constellation integrity fault	3			see text
P_{sat}	Probability of satellite integrity fault	3			see text
t_{correl}	Correlation time constant	3			see text
$M_{integrity}$	URA multiplier for integrity	3			see text
$M_{accuracy}$	URA multiplier for accuracy	3			see text
$b_{nominal}$	Nominal pseudorange bias	4			see text
Flags	Valid for ARAIM flags	63 x (2)			see text

* Parameters so indicated are two's complement, with the sign bit (+ or -) occupying the MSB.
** See Figure 20-15 for complete bit allocation in Message Type 38.
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with indicated bit allocation and scale factor.

Message Type 38 = Off-Line (Slow) ISM

20.3.3.10.2 GNSS Constellation ID.

Bits 129 through 131 of message type 38 shall identify the other GPS-like navigation system to which the associated ISM parameters apply. The four bits are defined as follows:

0000 = No data available
0001 = Galileo
0010 = GLONASS
0011 = BeiDou
0100 = GPS
0101 = SBAS
0110 = QZSS
0111 = IRNSS
1000 through 1111 = Reserved for other systems

Message Type 38 = Off-Line (Slow) ISM

Table 20-XIII. ARAIM Validity Flag Mapping

Bits	Galileo	GLONASS	BeiDou	GPS	SBAS	QZSS	IRNSS
151-152	SVID 1	Freq. 1	RCN 1	PRN 1	PRN 120	PRN 183	PRN 1
153-154	SVID 2	Freq. 2	RCN 2	PRN 2	PRN 121	PRN 184	PRN 2
155-156	SVID 3	Freq. 3	RCN 3	PRN 3	PRN 122	PRN 185	PRN 3
157-158	SVID 4	Freq. 4	RCN 4	PRN 4	PRN 123	PRN 186	PRN 4
159-160	SVID 5	Freq. 5	RCN 5	PRN 5	PRN 124	PRN 187	PRN 5
161-162	SVID 6	Freq. 6	RCN 6	PRN 6	PRN 125	PRN 188	PRN 6
163-164	SVID 7	Freq. 7	RCN 7	PRN 7	PRN 126	PRN 189	PRN 7
165-166	SVID 8	Freq. 8	RCN 8	PRN 8	PRN 127	PRN 190	Invalid
167-168	SVID 9	Freq. 9	RCN 9	PRN 9	PRN 128	PRN 191	Invalid
169-170	SVID 10	Freq. 10	RCN 10	PRN 10	PRN 129	PRN 192	Invalid
171-172	SVID 11	Freq. 11	RCN 11	PRN 11	PRN 130	PRN 193	Invalid
173-174	SVID 12	Freq. 12	RCN 12	PRN 12	PRN 131	PRN 194	Invalid
175-176	SVID 13	Freq. 13	RCN 13	PRN 13	PRN 132	PRN 195	Invalid
177-178	SVID 14	Freq. 14	RCN 14	PRN 14	PRN 133	PRN 196	Invalid
179-180	SVID 15	Freq. 15	RCN 15	PRN 15	PRN 134	PRN 197	Invalid
181-182	SVID 16	Freq. 16	RCN 16	PRN 16	PRN 135	PRN 198	Invalid
183-184	SVID 17	Freq. 17	RCN 17	PRN 17	PRN 136	PRN 199	Invalid
185-186	SVID 18	Freq. 18	RCN 18	PRN 18	PRN 137	PRN 200	Invalid
187-188	SVID 19	Freq. 19	RCN 19	PRN 19	PRN 138	PRN 201	Invalid
189-190	SVID 20	Freq. 20	RCN 20	PRN 20	PRN 139	PRN 202	Invalid
191-192	SVID 21	Freq. 21	RCN 21	PRN 21	PRN 140	Invalid	Invalid
193-194	SVID 22	Freq. 22	RCN 22	PRN 22	PRN 141	Invalid	Invalid
195-196	SVID 23	Freq. 23	RCN 23	PRN 23	PRN 142	Invalid	Invalid
197-198	SVID 24	Freq. 24	RCN 24	PRN 24	PRN 143	Invalid	Invalid
199-200	SVID 25	Freq. 25	RCN 25	PRN 25	PRN 144	Invalid	Invalid
201-202	SVID 26	Freq. 26	RCN 26	PRN 26	PRN 145	Invalid	Invalid
203-204	SVID 27	Freq. 27	RCN 27	PRN 27	PRN 146	Invalid	Invalid
205-206	SVID 28	Freq. 28	RCN 28	PRN 28	PRN 147	Invalid	Invalid
207-208	SVID 29	Freq. 29	RCN 29	PRN 29	PRN 148	Invalid	Invalid
209-210	SVID 30	Freq. 30	RCN 30	PRN 30	PRN 149	Invalid	Invalid
211-212	SVID 31	Freq. 31	RCN 31	PRN 31	PRN 150	Invalid	Invalid
213-214	SVID 32	Freq. 32	RCN 32	PRN 32	PRN 151	Invalid	Invalid
215-216	SVID 33	Invalid	RCN 33	PRN 33	PRN 152	Invalid	Invalid
217-218	SVID 34	Invalid	RCN 34	PRN 34	PRN 153	Invalid	Invalid
219-220	SVID 35	Invalid	RCN 35	PRN 35	PRN 154	Invalid	Invalid
221-222	SVID 36	Invalid	RCN 36	PRN 36	PRN 155	Invalid	Invalid
223-224	Invalid	Invalid	RCN 37	PRN 37	PRN 156	Invalid	Invalid
225-226	Invalid	Invalid	Invalid	PRN 38	PRN 157	Invalid	Invalid
227-228	Invalid	Invalid	Invalid	PRN 39	PRN 158	Invalid	Invalid
229-230	Invalid	Invalid	Invalid	PRN 40	Invalid	Invalid	Invalid
231-232	Invalid	Invalid	Invalid	PRN 41	Invalid	Invalid	Invalid
233-234	Invalid	Invalid	Invalid	PRN 42	Invalid	Invalid	Invalid
235-236	Invalid	Invalid	Invalid	PRN 43	Invalid	Invalid	Invalid
237-238	Invalid	Invalid	Invalid	PRN 44	Invalid	Invalid	Invalid

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Thank You

MT-38 FOR IS-GPS-200

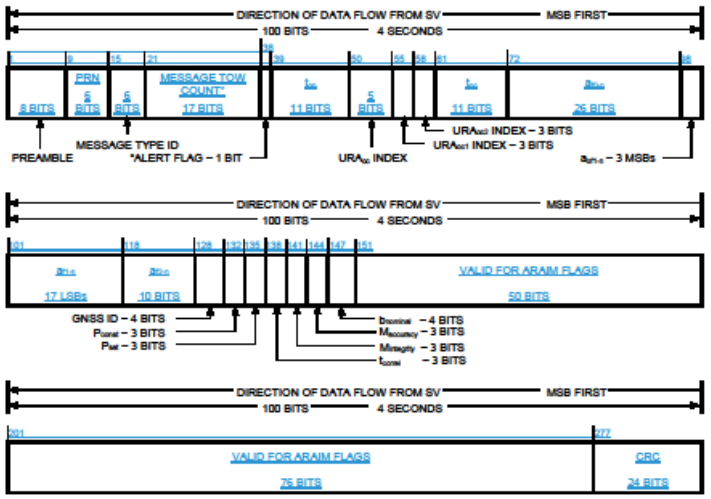
7 Aug 16
12 Jun 16
1 Jun 16
24 May 16

IS-GPS-200H MODIFICATIONS

For Adding

Off-Line (Slow) Integrity Support Message (ISM) = MT-38

1. Globally renumber "Figure 30-16" to become "Figure 30-17".
2. Globally renumber "Figure 30-15" to become "Figure 30-16".
3. Insert new "Figure 30-15" as follows.



* MESSAGE TOW COUNT = 17 MSB OF ACTUAL TOW COUNT AT START OF NEXT 12-SECOND MESSAGE

Figure 30-15. Message Type 38 – Off-Line Integrity Support Message (ISM)

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MT-38 FOR IS-GPS-705

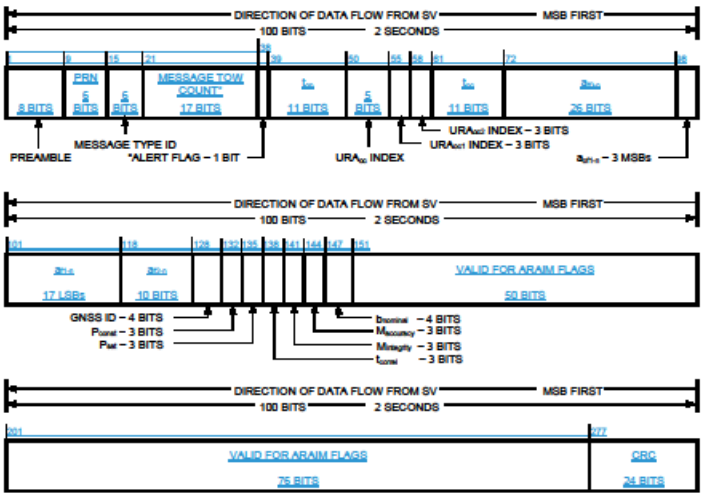
7 Aug 16
12 Jun 16

IS-GPS-705D MODIFICATIONS

For Adding

Off-Line (Slow) Integrity Support Message (ISM) = MT-38

1. Globally renumber "Figure 20-17" to become "Figure 20-18".
2. Globally renumber "Figure 20-16" to become "Figure 20-17".
3. Globally renumber "Figure 20-15" to become "Figure 20-16".
4. Insert new "Figure 20-15" as follows.



* MESSAGE TOW COUNT = 17 MSB OF ACTUAL TOW COUNT AT START OF NEXT 6-SECOND MESSAGE

Figure 20-15. Message Type 38 – Off-Line Integrity Support Message (ISM)

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MT-38 FOR IS-GPS-800

4 Aug 16

IS-GPS-800D MODIFICATIONS

For Adding

Off-Line (Slow) Integrity Support Message (ISM) = Subframe 38

1. Globally renumber "Figure 3.5-10" to become "Figure 3.5-11".
2. Globally renumber "Figure 3.5-9" to become "Figure 3.5-10".
3. Insert new "Figure 3.5-9" as follows.

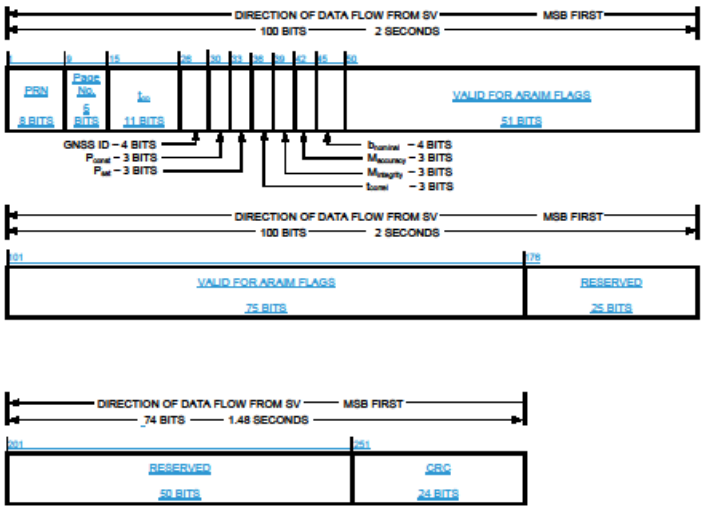

Figure 3.5-9. Subframe 3, Page 38 – Off-Line Integrity Support Message (ISM)

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CARRIER PHASE NOISE VIA 3RD ORDER JAFFE-RECHTIN PLL

K. Kovach (GPE/Aerospace)
Ha Nguyen (GPC)

PLL – Phase Lock Loop

Carrier Phase Noise via 3rd Order Jaffe-Rechtin PLL: 350% Relaxation

Karl Kovach, SMC/GPE(Aero)
Ha Nguyen, SMC/GPC

Public Interface Control Working Group (PICWG)
21-22 September 2016

Overview

- **This was an issue in the 2010 era**
  - *Partially from Lockheed Martin*
  - *Partially from Aerospace (Bakeman)*
  - *Partially from GPC*
- **Issue has been settled**
  - *IS-GPS-200, IS-GPS-705, IS-GPS-800 are fine as now written*
    - Not ‘perfect’, but ‘acceptable’

Carrier Phase Noise in IS-GPS-200

- **ICD-GPS-200 N/C (5 Nov 82)**
  - *"The phase noise spectral density of the unmodulated carrier shall be such that a phase locked loop of 10 Hz one-sided noise bandwidth shall be able to track the carrier to an accuracy of 0.1 radians rms."*
- **ICD-GPS-200A, ICD-GPS-200B, ICD-GPS-200C**
  - *Ditto*
- **IS-GPS-200D, IS-GPS-200E, ICD-GPS-200F**
  - *Ditto*
- **IS-GPS-200G, ICD-GPS-200H**
  - *Ditto*

Carrier Phase Noise in IS-GPS-705

- **IS-GPS-705 N/C (24 Nov 03)**
  - *"The phase noise spectral density of the unmodulated carrier shall be such that a phase locked loop of 10 Hz one-sided noise bandwidth shall be able to track the carrier to an accuracy of 0.1 radians root mean square (RMS). See additional supporting material for phase noise characteristics in section 6.3.2."*
- **IS-GPS-705A, IS-GPS-705B-R001, IS-GPS-705C, IS-GPS-705D**
  - *Ditto*

Carrier Phase Noise in IS-GPS-800

- **IS-GPS-800 N/C (4 Sep 08)**
  - *"The phase noise spectral density of the unmodulated carrier shall not exceed the magnitude of a straight line (on a log-log plot) between -30 dBc/Hz at 1 Hz and -70 dBc/Hz at 1 x 10^4Hz, and the one-sided integrated phase noise spectrum between 1 Hz and 10 kHz shall not exceed 0.01 radians rms.*

    Or,

    The phase noise spectral density of the unmodulated carrier shall be such that an approximation to the third order Jaffe-Rechtin phase lock loop, which has a 10 Hz one-sided loop noise bandwidth, shall be able to track the carrier to an accuracy of 0.01 radians rms."
- **IS-GPS-800A, IS-GPS-800B**
  - *Ditto*

Carrier Phase Noise in IS-GPS-800

- **IS-GPS-800C (5 Sep 12)**
  - *"~~The phase noise spectral density of the unmodulated carrier shall not exceed the magnitude of a straight line (on a log-log plot) between -30 dBc/Hz at 1 Hz and -70 dBc/Hz at 1 x 10^4Hz, and the one-sided integrated phase noise spectrum between 1 Hz and 10 kHz shall not exceed 0.01 radians rms.~~*

    ~~Or,~~

    The phase noise spectral density of the unmodulated carrier shall be such that an approximation to the third order Jaffe-Rechtin phase lock loop, closed-loop transfer function H(f) such that $|1 - H(f)|^2 = f^6/(f_n^6 + f^6)$ where $f_n = 3B_L/(5\Pi)$, which has a 10 Hz one-sided loop noise bandwidth, shall be able to track the carrier to an accuracy of ~~0.01~~0.035 radians rms."
- **IS-GPS-800D**
  - *Ditto*

Recommendations

- **None**
  - *No issue here for ICWG to consider*
    - Not in IS-GPS-800
    - Not across IS-GPS-200, IS-GPS-705, IS-GPS-800

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Assuring Space Mission Success

Thank You

OPERATIOAL ADVISORIES

B. Renfro (ARL:UT)

Comments on Operational Advisories – Mislabeled, Misleading, Mistaken

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September, 2016

Background

- The Operational Advisory (OA) message is defined in
  - ICD-GPS-240
  - ICD-GPS-870
- Quote from ICD-GPS-240, Section 20.1

> *"The Operational Advisory (OA) message provides a summary of the satellite constellation status."*

- The OA consists of
  - Header
  - Section one – satellites, planes, and clocks
  - Section two – current and recent advisories
  - Section three – points of contact for support and additional info.

Example of An Operational Advisory Message

```
UNCLASSIFIED
GPS OPERATIONAL ADVISORY        209.OA1
SUBJ: GPS STATUS      27 JUL 2016

1. SATELLITES, PLANES, AND CLOCKS (CS=CESIUM RB=RUBIDIUM):
A. BLOCK I : NONE
B. BLOCK II: PRNS  1,  2,  3,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15
   PLANE   : SLOT D2, D1, E1, E3, D4, A4, C3, F3, E2, D5, B4, F6, F1, F2
   CLOCK   :      RB, RB, RB, RB, RB, RB, CS, RB, RB, RB, RB, RB, RB, RB
   BLOCK II: PRNS 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29
   PLANE   : SLOT B1, C4, E4, C5, B6, D3, E6, F4, A1, B2, B5, C2, B3, C1
   CLOCK   :      RB, RB, RB, RB, RB, RB, RB, RB, CS, RB, RB, RB, RB, RB
   BLOCK II: PRNS 30, 31, 32
   PLANE   : SLOT A3, A2, F5
   CLOCK   :      RB, RB, RB
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)

2016043       151521Z JUL 2016    26   FCSTDV        204/0820-204/2020
<Records omitted to reduce size>
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)
<Records omitted to reduce size>

3. REMARKS:
A. THE POINT OF CONTACT FOR GPS MILITARY OPERATIONAL SUPPORT IS THE GPS
OPERATIONS CENTER AT 719-567-2541 OR DSN 560-2541.
B. CIVILIAN:  FOR INFORMATION, CONTACT US COAST GUARD NAVCEN AT
COMMERCIAL 703-313-5900 24 HOURS DAILY AND INTERNET
HTTP://WWW.NAVCEN.USCG.GOV
C. MILITARY SUPPORT WEBPAGES CAN BE FOUND AT THE FOLLOWING
HTTPS://GPS.AFSPC.AF.MIL/GPS OR HTTPS://GPS.AFSPC.AF.MIL/GPSOC
```

Problems With Operational Advisory Messages

- Format limitations
  - Persistent problem since we moved to expanded slot constellation
- Inaccuracies
- Limitations in source of OA data
  - Problem whenever more than 6 SVs in a plane

- Concern – Publishing and archiving incorrect information reduces trust in the product
- Examples of each of these problems follow

Format Limitations

- GPS has been operated as a 24+3 constellation with three expanded slots since 2011
  - AF press release on June 15, 2011 announced completion of transition
- SPS PS constellation definition
  - The three expanded slots have “fore” and “aft” positions
  - These are denoted by F/A in the SPS PS: e.g., B1F, F2A
  - Operators use this definition also
- OA definition does not support fore/aft nomenclature
  - Definition limited to one letter (plane) and one number (slot)
  - As a result, “aft” is shown as the base slot and “fore” is shown as slot 5
    - For example, F2A shows up as F2, F2F shows up as F5
  - The workaround is documented on the NAVCEN’s GPS Constellation Status Page: http://www.navcen.uscg.gov/?Do=constellationStatus
  - Note: the workaround does not provide any way to distinguish between a slot that has been collapsed vs. a slot with the “fore” position empty
    - This already happened in slot B1F from March 2013 – April 2015.

Definition of 24+3 Constellation from SPS PS

expanded slots

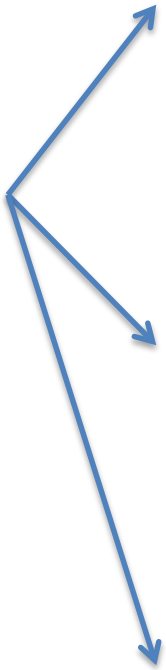


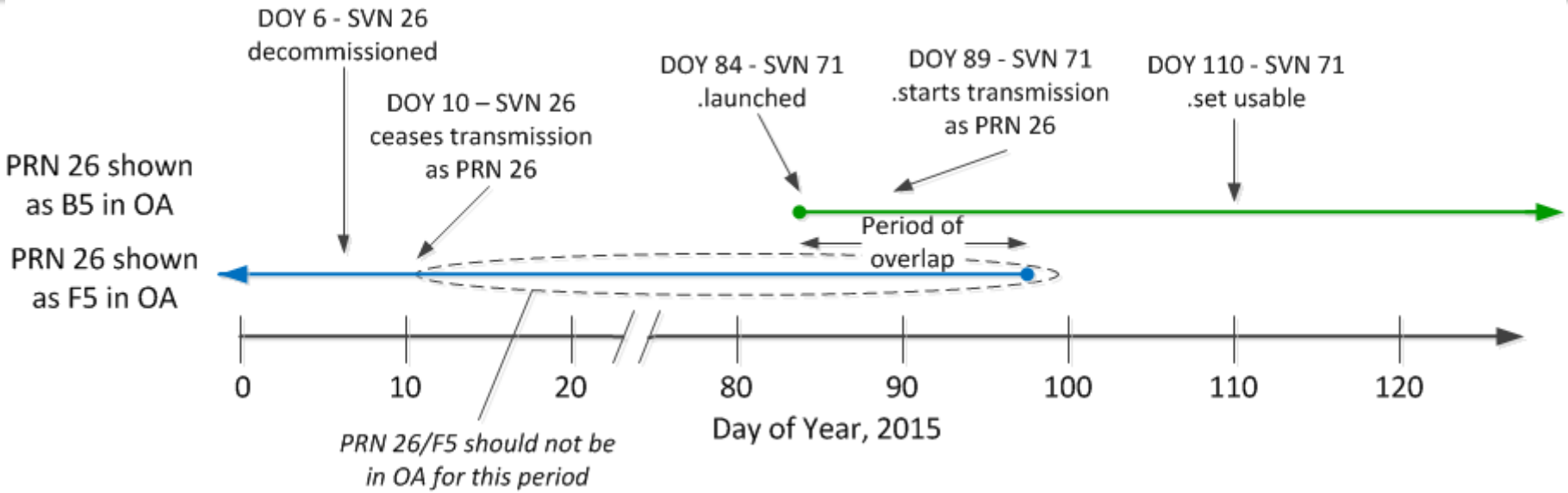
Table A.2-2. Expandable 24-Slot Constellation Almanac, at Epoch of 00:00:00 on 1 Jul 93

Slot ID	e (unit less)	δ_i (degrees)	OMEGADOT (deg/sec)	A (meters)	$OMEGA_0$ (degrees)	ω (degrees)	M_0 (degrees)
A1	0.000	1.000	-4.4874E-7	26,559,710	357.734	0.000	268.126
A2	0.000	1.000	-4.4874E-7	26,559,710	357.734	0.000	161.786
A3	0.000	1.000	-4.4874E-7	26,559,710	357.734	0.000	11.676
A4	0.000	1.000	-4.4874E-7	26,559,710	357.734	0.000	41.806
B1F	0.000	1.000	-4.4874E-7	26,559,710	57.734	0.000	94.916
B1A	0.000	1.000	-4.4874E-7	26,559,710	57.734	0.000	66.356
B2	0.000	1.000	-4.4874E-7	26,559,710	57.734	0.000	173.336
B3	0.000	1.000	-4.4874E-7	26,559,710	57.734	0.000	309.976
B4	0.000	1.000	-4.4874E-7	26,559,710	57.734	0.000	204.376
C1	0.000	1.000	-4.4874E-7	26,559,710	117.734	0.000	111.876
C2	0.000	1.000	-4.4874E-7	26,559,710	117.734	0.000	11.796
C3	0.000	1.000	-4.4874E-7	26,559,710	117.734	0.000	339.666
C4	0.000	1.000	-4.4874E-7	26,559,710	117.734	0.000	241.556
D1	0.000	1.000	-4.4874E-7	26,559,710	177.734	0.000	135.226
D2F	0.000	1.000	-4.4874E-7	26,559,710	177.734	0.000	282.676
D2A	0.000	1.000	-4.4874E-7	26,559,710	177.734	0.000	257.976
D3	0.000	1.000	-4.4874E-7	26,559,710	177.734	0.000	35.156
D4	0.000	1.000	-4.4874E-7	26,559,710	177.734	0.000	167.356
E1	0.000	1.000	-4.4874E-7	26,559,710	237.734	0.000	197.046
E2	0.000	1.000	-4.4874E-7	26,559,710	237.734	0.000	302.596
E3	0.000	1.000	-4.4874E-7	26,559,710	237.734	0.000	66.066
E4	0.000	1.000	-4.4874E-7	26,559,710	237.734	0.000	333.686
F1	0.000	1.000	-4.4874E-7	26,559,710	297.734	0.000	238.886
F2F	0.000	1.000	-4.4874E-7	26,559,710	297.734	0.000	0.456
F2A	0.000	1.000	-4.4874E-7	26,559,710	297.734	0.000	334.016
F3	0.000	1.000	-4.4874E-7	26,559,710	297.734	0.000	105.206
F4	0.000	1.000	-4.4874E-7	26,559,710	297.734	0.000	135.346

Example of An OA Inaccuracy

- PRN 26 listed in both F5 (F2F) and B5 (B1F) for DOY 84-98, 2015
- Up through DOY 6, PRN 26 assigned to SVN 26
  - SVN 26 had occupied slot F2F. SVN 43/PRN 13 took over that responsibility
  - DECOM NANU 2015005. Transmission from SVN 26 as PRN 26 ceased DOY 10
- PRN 26 next assigned to SVN 71
  - SVN 71 launched on DOY 84 (NANU 2015019) into slot B1F (B5 by OA)
  - SVN 71 began transmission (unhealthy) on DOY 89
    - initially usable on DOY 110 (NANU 2015028)
- PRN 26 incorrectly appeared in OA as F5 (F2F) from DOY 11-98
  - PRN 26 should have been entirely missing for OA for DOY 11-83
- PRN 26 correctly appeared in OA as B5 (B1F) starting DOY 84
- Not only were we providing inaccurate information at the time, the problem persists in the historical record
  - Review of NANUs clears up the issues, but requires time and some level of expertise

Example of an OA Inaccuracy – Time-History Plot



Excerpt from OA for Day 85, 2015

```
UNCLASSIFIED
GPS OPERATIONAL ADVISORY        085.OA1
SUBJ: GPS STATUS       26 MAR 2015

1. SATELLITES, PLANES, AND CLOCKS (CS=CESIUM RB=RUBIDIUM):
A. BLOCK I : NONE
B. BLOCK II: PRNS  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14
   PLANE    : SLOT D2, D1, B6, D6, E3, D4, A4, A6, F3, E6, D5, B4, F6, F1
   CLOCK    :      RB, RB, RB, RB, RB, RB, RB, CS, RB, CS, RB, RB, RB, RB
   BLOCK II: PRNS 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 26, 27
   PLANE    : SLOT F2, B1, C4, E4, C3, E1, D3, E2, F4, A1, B2, B5, F5, C2
   CLOCK    :      RB, RB, RB, RB, RB, RB, RB, RB, RB, CS, RB, RB, CS, RB
   BLOCK II: PRNS 28, 29, 30, 31, 32
   PLANE    : SLOT B3, C1, A3, A2, E5
   CLOCK    :      RB, RB, RB, RB, RB
```

Limitations in Source Data – The SV That Changed Planes

- OA shows SVN 51/PRN 20 assigned to E1 through DOY 110 of 2015
- OA designation for PRN 20 changes to B6 on DOY 111
  - PRN remains in this state up to this writing
  - DOY 111 corresponds to the day SVN 69/PRN 3 transitioned to E1
- From other sources, I believe the operators regard SVN 51/PRN 20 as being in E7
- Multiple sources tell me that there is a “six SV per plane” limit somewhere in the process. Therefore if there are more than six SVs in a plane, some are “administratively moved” to other planes for purposes of the OA
- If correct, this limitation leads to publication of inaccurate data
  - These data are being retained in the NAVCEN archives

Possible Fixes - 1

- Take no action
  - Continue publishing misleading, mislabeled, and mistaken data
  - Only a few subject matters experts appear to notice these flaws or care
  - On the other hand
    - OAs are archived by NAVCEN
    - FAA and ARL:UT need slot information for PAN reports, monthly report cards, and yearly performance analyses
    - *GPS World* and Univ. of New Brunswick both publish constellation data on-line
      - *GPS World* even includes notes on the SVN 51 E7/B6 confusion
- Fix the primary persistent problems
  - Change OA definition to accommodate unambiguous description of expanded/collapsed slot and F/A definition consistent with SPS PS
  - Change OA definition to show any SV beyond the "4 slots" as only being "in plane X" without specifying slot
    - Beyond the 24+3 slots, there are no defined locations for slots
  - Would need to develop a consensus on modified representation
  - Impacts requirements already on contract
  - Impacts deployed systems that refer to the OA (if any)

Possible Fixes - 2

- Fix persistent problems and increase information in the OA
  - Fix the persistent problems as outline in previous option
  - Add PRN/SVN relationships
    - Currently documented in NANU as “header information” an “on change”
    - No official comprehensive record in public
  - Same impact as for fixing the problems

- TODAY’S PURPOSE
  - Bring this matter to the ICWG – attempt to build some consensus for action
  - Doing anything will require a gov’t sponsor/champion

DISCUSSION

SOME BITS OF WARNING: HOW A CHANGE IN IS-GPS-705 AND IS-GPS-800 COULD SAVE LIVES

D. Spinden (Rockwell Collins)

OPEN DISCUSSION

ACTION ITEM REVIEW

Closing Remarks

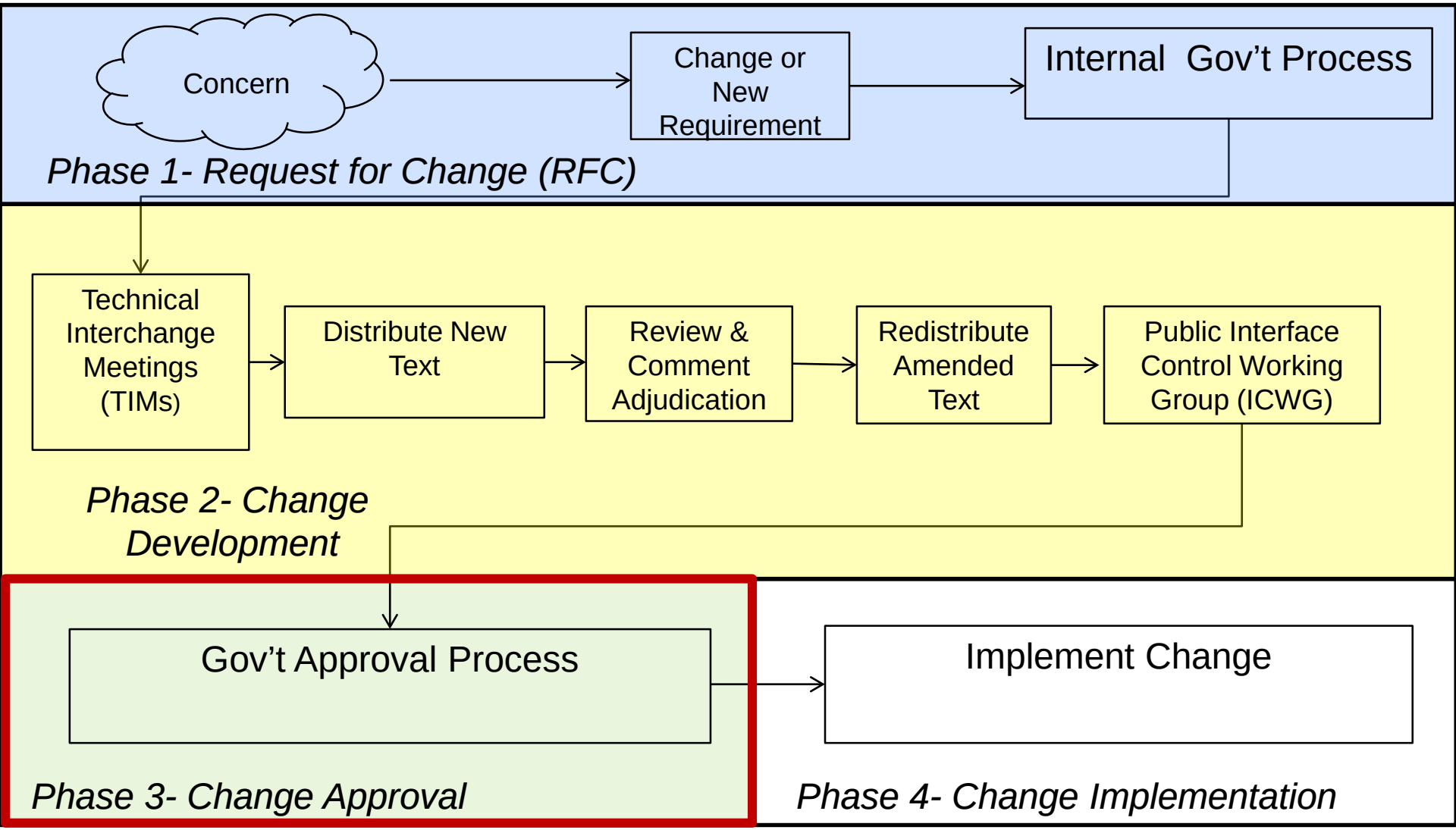
James Horejsi

Chief Engineer, Global Positioning Systems (GPS) Directorate Space and Missile Systems Center

Closing Comments

- 2017 meetings for the GPS public documents are tentatively scheduled for September
- Direct any follow-up communication related to this meeting to smcgper@us.af.mil
- Final updates to the public documents will be available on GPS.gov following approval by the configuration control board
- Please provide feedback to the GPS requirements team to enable the continual improvement of this meeting

Change Management High Level Process Flow



Thank You