CHANGE NOTICE

Affected Document: IS-GPS-800 Rev H IRN/SCN Number XXX-XXX-XXXX-XXX Date: XX-XXX-XXXX

Authority: RFC-00467 **Proposed Change Notice** PCN-IS-800H RFC467

Date: 29-SEP-2021

CLASSIFIED BY: N/A DECLASSIFY ON: N/A

Document Title: NAVSTAR GPS Space Segment / Navigation User Interfaces

RFC Title: 2021 Proposed Changes to the Public Documents

Reason For Change (Driver):

- 1. Reserved/spare bits in the CNAV/CNAV-2 in IS-GPS-200 are assumed to be a static bit pattern. With the current proposed implementation to fill those bits with a pseudorandom bit pattern, users are at risk of incorrectly using those bits for integrity checks.
- 2. The GPS IIIF SV Configuration Code '101' confirms that the "alert" in HOW is still applicable. As such, one of the public stakeholder was requesting clarification to confirm if the "alert" in the HOW will also be applicable in the future undefined configuration codes. This is not sufficient for safety-of-life equipment that would need to have the confirmation because the alert is part of the "marginal" conditions leading to the selection/deselection of a satellite in a RAIM or ARAIM integrity context.
- 3. Current Issue of Data and Clock (IODC) requirement in IS-GPS-200 states that the IODC will be different from any value transmitted by the SV during the preceding 7-days. In certain occasions, current operations have shown not to follow that requirement.
- 4. The descriptions of how the navigation message changes with time (for example, transitions between data sets, or behavior under extended navigation) do not capture all the implementation differences between earlier SVs and GPS III/IIIF.
- 5. Documents need clarification and clean-up, as identified in past Public ICWGs and as newly-identified changes of administrative nature.

Description of Change:

- 1. Clarify language in IS-GPS-200, IS-GPS-705 and IS-GPS-800 to tell users to not utilize the spare/reserved bits.
- 2. Add clarification to the SV Configuration Code section for the undefined SV codes.
- 3. Modify or delete the IODC requirement.
- 4. Update the timing-related information to reflect the current implementation, including aspects specific to GPS III/IIIF.
- 5. Provide clarity and clean up identified administrative changes in all affected documents.

Authored By: RE: Tony Anthony Checked By: RE: Serena Chang							
AUTHORIZED SIGNATURES	REPRESEN	TING	DATE				
	PNT Capability Area Integration, Portfolio Architect, Space Systems Command - LAAFB						
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		CODE IDENT 66RP1					

IS800-5:

Section Number:

1.2.0-1

WAS:

Utilizing the L1 open link defined in this document, GPS space vehicles (SVs), except Block II/IIA, IIR/IIR-M, and IIF SVs, shall transmit continuous earth coverage L1C signal that provides the ranging codes and the system data needed to accomplish the navigation mission to all users having RF visibility to SVs and suitable receivers.

Redlines:

Utilizing the L1 open link defined in this document, GPS space vehicles (SVs), except Block II/IIA,-IIR/IIR-M, and IIF SVs, shall transmit continuous earth coverage L1C signal that provides the ranging codes and the system data needed to accomplish the navigation mission to all users having RF visibility to SVs and suitable receivers. IS:

Utilizing the L1 open link defined in this document, GPS space vehicles (SVs), except Block IIR/IIR-M, and IIF SVs, shall transmit continuous earth coverage L1C signal that provides the ranging codes and the system data needed to accomplish the navigation mission to all users having RF visibility to SVs and suitable receivers.

Rationale:

Delete II/IIA references

IS800-161:

Section Number: 3.5.3.0-12 **WAS**:

		No. of	Scale Factor	Valid	
	Parameter	Bits**	(LSB)	Range***	Units
URA _{NED0} Index	NED Accuracy Index	5*			(see text)
URA _{NED1} Index	NED Accuracy Change Index	3			(see text)
URAned2 Index	NED Accuracy Change Rate Index	3			(see text)
af2-n	SV Clock Drift Rate Correction Coefficient	10*	2-60		sec/sec ²
af1-n	SV Clock Drift Correction Coefficient	20*	2-48		sec/sec
a _{f0-n}	SV Clock Bias Correction Coefficient	26*	2 ⁻³⁵		seconds
T _{GD} ****	Inter-Signal Correction for L1 or L2 P(Y)	13*	2 ⁻³⁵		seconds
ISC _{L1CP} ****	Inter-Signal Correction for L1C _P	13*	2 ⁻³⁵		seconds
ISCL1CD****	Inter-Signal Correction for $L1C_D$	13*	2 ⁻³⁵		seconds
WN _{op}	CEI Data Sequence Propagation Week Number	8	1		weeks
* Paramet	ers so indicated are in two's complement not	ation;			
** See Figu	re 3.5-1 for complete bit allocation in Subfran	ne 2;			
	therwise indicated in this column, valid range d bit allocation and scale factor.	e is the max	kimum rar	nge attainable	with

	Parameter	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
URA _{NED0} Index	NED Accuracy Index	5*			(see <u>text</u> <u>3.5.3.8</u>)
URA _{NED1} Index	NED Accuracy Change Index	3			(see <u>text3.5.3.8</u>)
URA _{NED2} Index	NED Accuracy Change Rate Index	3			(see <u>text3.5.3.8</u>)
a _{f2-n}	SV Clock Drift Rate Correction Coefficient	10*	2-60		sec/sec ²
a _{fl-n}	SV Clock Drift Correction Coefficient	20*	2 ⁻⁴⁸		sec/sec
a _{f0-n}	SV Clock Bias Correction Coefficient	26*	2-35		seconds
T _{GD} ****	Inter-Signal Correction for L1 or L2 P(Y)	13*	2-35		seconds
ISC _{L1CP} ****	Inter-Signal Correction for L1C _P	13*	2-35		seconds
ISC _{L1CD} ****	Inter-Signal Correction for L1C _D	13*	2-35		seconds
WN _{op}	CEI Data Sequence Propagation Week Number	8	1		weeks
** See Figu	ers so indicated are in two's complement notation re 3.5-1 for complete bit allocation in Subframe 2 therwise indicated in this column, valid range is th	;	n range at	tainable wit	h indicated bit

	Parameter	No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
URA _{NED0} Index	NED Accuracy Index	5*			(see 3.5.3.8)
URA _{NED1} Index	NED Accuracy Change Index	3			(see 3.5.3.8)
URA _{NED2} Index	NED Accuracy Change Rate Index	3			(see 3.5.3.8)
a _{f2-n}	SV Clock Drift Rate Correction Coefficient	10*	2-60		sec/sec ²
a _{fl-n}	SV Clock Drift Correction Coefficient	20*	2-48		sec/sec
a _{f0-n}	SV Clock Bias Correction Coefficient	26*	2-35		seconds
T _{GD}	Inter-Signal Correction for L1 or L2 P(Y)	13*	2-35		seconds
ISC _{L1CP}	Inter-Signal Correction for L1C _P	13*	2-35		seconds
ISC _{L1CD}	Inter-Signal Correction for L1C _D	13*	2-35		seconds
WN _{op}	CEI Data Sequence Propagation Week Number	8	1		weeks
	ers so indicated are in two's complement notation re 3.5-1 for complete bit allocation in Subframe 2				
*** Unless o	therwise indicated in this column, valid range is the n and scale factor.		m range at	tainable with	h indicated bit

Rationale:

Table legend updates from previous RFC

10/14/2021 Corrected the original edit so the "***" note about was properly included. Replace "(see text)" with the specific applicable section to improve reader experience (T. Anthony)

IS800-1173:

Insertion after object IS800-262

Section Number:

3.5.4.3.6.0-2

WAS:

<INSERTED OBJECT>

Redlines:

The Midi almanac parameters shall be updated by the CS at least once every 3 days while the CS is able to upload the SVs. If the CS is unable to upload the SVs, the accuracy of the Midi almanac parameters transmitted by the SVs will degrade over time.

IS:

The Midi almanac parameters shall be updated by the CS at least once every 3 days while the CS is able to upload the SVs. If the CS is unable to upload the SVs, the accuracy of the Midi almanac parameters transmitted by the SVs will degrade over time.

Rationale:

The Midi almanac description is missing the CS update requirement, which is 3 days for modernized almanac formats, same as for the Reduced Almanac in IS-GPS-800 3.5.4.3.5.

IS800-1057:

Section Number:

3.5.4.7.1.7

WAS:

Object Heading: Satellite Fault Probability

Redlines:

Object Heading: Satellite Fault ProbabilityRate

IS:

Object Heading: Satellite Fault Rate

Rationale:

CRM #282 11/29/2021 The value described in this paragraph is a Rate and not a Probability. This change is being made uniformly across IS-GPS-200, IS-GPS-705 and IS-GPS-800 (T. Anthony)

IS800-1058:

Section Number:

3.5.4.7.1.7.0-1

WAS:

Bits 50 through 53 of Subframe 3, Page 8 shall provide the assumed Satellite Fault Probability (R_{sat}) value for ARAIM at the current time for the associated GNSS constellation.

Redlines:

Bits 50 through 53 of Subframe 3, Page 8 shall provide the assumed Satellite Fault ProbabilityRate (R_{sat}) value for ARAIM at the current time for the associated GNSS constellation.

IS:

Bits 50 through 53 of Subframe 3, Page 8 shall provide the assumed Satellite Fault Rate (R_{sat}) value for ARAIM at the current time for the associated GNSS constellation.

Rationale:

CRM #282 11/29/2021 The value described in this paragraph is a Rate and not a Probability. This change is being made uniformly across IS-GPS-200, IS-GPS-705 and IS-GPS-800 (T. Anthony)

IS800-289:

Section Number:

3.5.5.1.0-2

WAS:

Cutovers of subframe 2 data to new CEI data sets will nominally occur on hour boundaries except for the first CEI data set of a new CEI data sequence propagation.

Redlines:

Cutovers of subframe 2 data to new CEI data sets will nominally occur on hour boundaries except for the first CEI data set of a new CEI data sequence propagation.

IS:

<DELETED OBJECT>

Rationale:

Deleted duplicate information also present in 3.5.5.2.

IS800-1158:

Section Number:

3.5.5.2.0-2

WAS:

Cutovers to new CEI data sets will occur only on hour boundaries except for the first CEI data set of a new CEI data sequence propagation. The first CEI 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.

Redlines:

Cutovers to new CEI data sets will occur only on <u>two-</u>hour boundaries except for the first CEI data set of a new CEI data sequence propagation.- The first CEI data set may be cut-in (reference paragraph 3.5.5.1) at any time during the <u>hourtwo</u> <u>hours</u> and therefore may be transmitted by the SV for less than <u>onetwo</u> <u>hourhours</u>.

IS:

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

Rationale:

All modernized CEI data set cutovers nominally occur on "even" hour boundaries.

IS800-1159:

Section Number:

3.5.5.2.0-3

WAS:

The start of the transmission interval for each CEI data set corresponds to the beginning of the curve fit interval for the CEI data set. Each CEI 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 CEI data set is rendered obsolete before the end of its curve fit interval when it is superseded by the SV cutting over to the first CEI data set of a new CEI data sequence propagation. **Redlines**:

The Except for the first CEI data set of a new CEI data sequence propagation, the start of the transmission interval for each CEI data set corresponds to the beginning of the curve fit interval for the CEI data set.- Each CEI 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 CEI data set is rendered obsolete before the end of its curve fit interval when it is superseded by the SV cutting over to the first CEI data set of a new CEI data sequence propagation.

IS:

Except for the first CEI data set of a new CEI data sequence propagation, the start of the transmission interval for each CEI data set corresponds to the beginning of the curve fit interval for the CEI data set. Each CEI 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 CEI data set is rendered obsolete before the end of its curve fit interval when it is superseded by the SV cutting over to the first CEI data set of a new CEI data sequence propagation.

Rationale:

CRM #280 9/3/2021 Normalized the wording for when the transmission interval matches the beginning of the curve fit interval across all signals (T. Anthony)

IS800-1172:

Insertion after object IS800-1159 Section Number: 3.5.5.2.0-4 WAS: <INSERTED OBJECT> Redlines: The start time of the curve fit inte

The start time of the curve fit interval of the first CEI data set of a new CEI data sequence propagation may be later than the start time of the curve fit interval of the preceding CEI data set that was transmitted prior to the cutover. The beginning of the curve fit interval of the first CEI data set of a new CEI data sequence propagation will be a multiple of 300 seconds (5 minutes) relative to the start of week.

Object Type: <u>Info-Only</u>

IS:

The start time of the curve fit interval of the first CEI data set of a new CEI data sequence propagation may be later than the start time of the curve fit interval of the preceding CEI data set that was transmitted prior to the cutover. The beginning of the curve fit interval of the first CEI data set of a new CEI data sequence propagation will be a multiple of 300 seconds (5 minutes) relative to the start of week.

Object Type: Info-Only

Rationale:

New information (using wording that accommodates the differences in CEI data set implementation for IIR/IIR-M/IIF and GPS III/IIF) to explain the constraints on selection of the new curve fit interval, for the first CEI data set of a new CEI data sequence propagation.

CRM #243 8/24/2021 Changed over to 15 minute boundaries for curve fit interval starts for uniformity across all documents (T. Anthony)

10/19/21 Set 900 second interval to 300 seconds per the Public ICWG (T. Anthony)

IS800-917:

Section Number:

6.2.8.1-2

Symbol	Parameter Name	Subframe
À	Change Rate in Semi-major Axis	2
ΔA	Semi-major Axis Difference at Reference Time	2
Δn_0	Mean Motion Difference from Computed Value at Reference Time	2
$\Delta \dot{n_0}$	Rate of Mean Motion Difference from Computed Value	2
Ω ₀	Longitude of Ascending Node of Orbit Plane at Weekly Epoch	2
ΔΩ	Rate of Right Ascension Difference	2
ω	Argument of Perigee	2
a _{f0}	SV Clock Bias Correction Coefficient	2
a _{f1}	SV Clock Drift Correction Coefficient	2
a _{f2}	Drift Rate Correction Coefficient Index	2
C _{ic}	Amplitude of the Cosine Harmonic Correction Term to the Angle of Inclination	2
C _{is}	Amplitude of the Sine Harmonic Correction Term to the Angle of Inclination	2
C _{rc}	Amplitude of the Cosine Harmonic Correction Term to the Orbit Radius	2
C _{rs}	Amplitude of the Sine Correction Term to the Orbit Radius	2
C _{uc}	Amplitude of Cosine Harmonic Correction Term to the Argument of Latitude	2
C _{us}	Amplitude of Sine Harmonic Correction Term to the Argument of Latitude	2
е	Eccentricity	2
i ₀	Inclination Angle at Reference Time	2
i _{0-n} -DOT	Rate of Inclination Angle	2
ISCL1CP	Inter-signal Correction	2
ISCL1CD	Inter-signal Correction	2
ISC_{L1CA}	Inter-signal Correction	3
ISC _{L2C}	Inter-signal Correction	3
ISC _{L515}	Inter-signal Correction	3
ISC_{L5Q5}	Inter-signal Correction	3
ISF	Integrity Status Flag NOTE1	2
ITOW	Interval Time of Week	2
L1C	Signal Health (1 bits)	2
M ₀	Mean Anomaly at Reference Time	2

Symbol	Parameter Name	Subframe				
T_{GD}	Group Delay Differential	2				
t _{oe}	Time of Ephemeris	2				
t _{op}	CEI Data Sequence Propagation Time of Week	2				
URA _{ED} Index	Elevation Dependent User Range Accuracy, URA _{ED} Index	2				
URA _{NEDO} Index	NED Accuracy Index	2				
URA _{NED1} Index	NED Accuracy Change Index	2				
URA _{NED2} Index	NED Accuracy Change Rate Index	2				
WN	Data Sequence Propagation Week Number	2				
Parameter Updates to	NOTE1: Parameters so indicated are for CEI Refinement – not limited to curve fit. Parameters not indicated are needed for/limited to curve fit. Updates to parameters in table shall prompt changes in t _{oe} . Any parameter marked with NOTE1 may be changed with or without a change in t _{oe} .					

Symbol	Parameter Name	Subframe
À	Change Rate in Semi-major Axis	2
ΔΑ	Semi-major Axis Difference at Reference Time	2
Δn_0	Mean Motion Difference from Computed Value at Reference Time	2
$\Delta \dot{n_0}$	Rate of Mean Motion Difference from Computed Value	2
Ω_0	Longitude of Ascending Node of Orbit Plane at Weekly Epoch	2
ΔΩ	Rate of Right Ascension Difference	2
ω	Argument of Perigee	2
a_{f0}	SV Clock Bias Correction Coefficient	2
$a_{\rm fl}$	SV Clock Drift Correction Coefficient	2
a _{f2}	Drift Rate Correction Coefficient Index	2
C _{ic}	Amplitude of the Cosine Harmonic Correction Term to the Angle of Inclination	2
C _{is}	Amplitude of the Sine Harmonic Correction Term to the Angle of Inclination	2
C _{rc}	Amplitude of the Cosine Harmonic Correction Term to the Orbit Radius	2
C _{rs}	Amplitude of the Sine Correction Term to the Orbit Radius	2
C _{uc}	Amplitude of Cosine Harmonic Correction Term to the Argument of Latitude	2
C _{us}	Amplitude of Sine Harmonic Correction Term to the Argument of Latitude	2
e	Eccentricity	2
i ₀	Inclination Angle at Reference Time	2
i _{0-n} -DOT	Rate of Inclination Angle	2
ISC _{L1CP}	Inter-signal Correction ^{NOTE1}	2
ISC _{L1CD}	Inter-signal Correction ^{NOTE1}	2
ISC _{L1CA}	Inter-signal Correction ^{NOTE1}	3
ISC _{L2C}	Inter-signal Correction ^{NOTE1}	3
ISC _{L515}	Inter-signal Correction ^{NOTE1}	3
ISC _{L5Q5}	Inter-signal Correction ^{NOTE1}	3
ISF	Integrity Status Flag NOTE1	2
ITOW	Interval Time of Week	2
L1C	Signal Health (1 bits)	2
M ₀	Mean Anomaly at Reference Time	2
T _{GD}	Group Delay Differential	2
t _{oe}	Time of Ephemeris	2
t _{op}	CEI Data Sequence Propagation Time of Week	2

Symbol	Parameter Name	Subframe				
URA _{ED} Index	Elevation Dependent User Range Accuracy, URA _{ED} Index	2				
URA _{NED0} Index	NED Accuracy Index	2				
URA _{NED1} Index	NED Accuracy Change Index	2				
URA _{NED2} Index	NED Accuracy Change Rate Index	2				
WN	Data Sequence Propagation Week Number	2				
	NOTE1: Parameters so indicated are for CEI Refinement – not limited to curve fit. Parameters not indicated are needed for/limited to curve fit.					
·	parameters in table shall prompt changes in t_{oe} . Any parameters 1 may be changed with or without a change in t_{oe} .	er marked				

Symbol	Parameter Name	Subframe		
À	Change Rate in Semi-major Axis	2		
ΔA	Semi-major Axis Difference at Reference Time	2		
Δn_0	Mean Motion Difference from Computed Value at Reference Time	2		
$\Delta \dot{n_0}$	Rate of Mean Motion Difference from Computed Value	2		
Ω_0	Longitude of Ascending Node of Orbit Plane at Weekly Epoch	2		
ΔΩ	Rate of Right Ascension Difference	2		
ω	Argument of Perigee	2		
a _{f0}				
a _{f1}	fl SV Clock Drift Correction Coefficient			
a _{f2}	_{f2} Drift Rate Correction Coefficient Index			
C _{ic}	Amplitude of the Cosine Harmonic Correction Term to the Angle of Inclination	2		
C _{is}	Amplitude of the Sine Harmonic Correction Term to the Angle of Inclination	2		
C _{rc}	Amplitude of the Cosine Harmonic Correction Term to the Orbit Radius			
C _{rs}	Amplitude of the Sine Correction Term to the Orbit Radius			
C _{uc}	Amplitude of Cosine Harmonic Correction Term to the Argument of Latitude	2		
C _{us}	Amplitude of Sine Harmonic Correction Term to the Argument of Latitude	2		
e	Eccentricity	2		
i ₀	Inclination Angle at Reference Time	2		
i _{0-n} -DOT	Rate of Inclination Angle	2		
ISC _{L1CP}	Inter-signal Correction ^{NOTE1}	2		
ISC _{L1CD}	Inter-signal Correction ^{NOTE1}	2		
ISC _{L1CA}	Inter-signal Correction ^{NOTE1}	3		
ISC _{L2C}	Inter-signal Correction ^{NOTE1}	3		
ISC _{L515}	Inter-signal Correction ^{NOTE1}	3		
ISC _{L5Q5}	Inter-signal Correction ^{NOTE1}	3		
ISF	Integrity Status Flag NOTE1	2		
ITOW	Interval Time of Week	2		
L1C	Signal Health (1 bits)	2		
M ₀	Mean Anomaly at Reference Time	2		
T _{GD}	Group Delay Differential	2		
t _{oe}	Time of Ephemeris	2		
t _{op}	CEI Data Sequence Propagation Time of Week	2		

Symbol	Parameter Name	Subframe				
URA _{ED} Index	Elevation Dependent User Range Accuracy, URA _{ED} Index	2				
URA _{NED0} Index	NED Accuracy Index	2				
URA _{NED1} Index	NED Accuracy Change Index	2				
URA _{NED2} Index	NED Accuracy Change Rate Index	2				
WN	Data Sequence Propagation Week Number	2				
	NOTE1: Parameters so indicated are for CEI Refinement – not limited to curve fit. Parameters not indicated are needed for/limited to curve fit.					
·	parameters in table shall prompt changes in t_{oe} . Any parameters 1 may be changed with or without a change in t_{oe} .	er marked				

Rationale:

Correct and regularize the terminology for this term to IDOT. Eliminate the misleading term i0-n-DOT. Change elsewhere throughout the document.

CRM #244 11/26/2021 Implement NOTE 1 references (T. Anthony)

IS800-166, IS800-904, IS800-911, IS800-919, IS800-913, IS800-901:

Section Number:

<many>.

WAS:

<many>.

Redlines:

<many>. IS: <many>

Rationale:

Remove trailing '.' character from all Headers, as they are not sentences.

Summary Statistics

of inserted requirements: 0
of modified requirements: 3
of deleted requirements: 1
of TBDs: 0
of TBRs: 0
of (added/modified) effectivities: 0
of VCRM additions: 0
of VCRM modifications: 0
of VCRM deletions: 0
of descriptive texts: 3
of (added/modified) tables: 2
of (added/modified) figures: 0

Verification Cross Reference Matrix:

Only new requirement objects and objects containing VCRM attributes that are being added, modified or deleted in this IRN/SCN will be shown in the "Was" and "Is" fields in the VCRM.

WAS:

DOORS ID	Object Number	Effectivity	CS Effectivity	Effectivity	Highest Verification Level		System Verification Method
IS800- 289	3.5.5.1.0-2	15	N/A	15	Module	SV US	Test Inspection

IS:

DOORS ID	Object Number	Effectivity			Effectivity	Highest Verification Level	0	System Verification Method
IS800- 289	<deleted></deleted>	<deleted></deleted>	<deleted></deleted>	<deleted></deleted>	<deleted></deleted>	<deleted></deleted>	<deleted></deleted>	<deleted></deleted>