CHANGE NOTICE

Affected Document:	IRN/SCN Number	Date:
IS-GPS-200 Rev J	IRN-IS-200J-001	28-NOV-2018
Authority:	**Proposed Change Notice**	**Date:**
RFC-00374	IS200J_RFC374	28-SEP-2018

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

Document Title: NAVSTAR GPS Space Segment / Navigation User Interface

RFC Title: 2018 Proposed Changes to the Public Documents

Reason For Change (Driver):

The following topic was deferred from the 2017 Public ICWG and will now be resolved by this RFC.

1. Currently the Operational Advisories (OAs) that are published and archived contain plane/slot descriptions that are not in the constellation definition provided to the public in the Standard Positioning Service (SPS) Performance Standard (PS). The OA does not have the capability to correctly publish information regarding fore/aft position since moving to the 24+3 constellation with three expanded slots. In addition, the Points of Contact of the OA are not represented in a way that allows for efficient updates. This is a follow-up to RFC-351, which was CCB-approved on 8-Jan-2018.

The following topic resolves 3 document clean-up related activities:

2. a) Signal-in-space topics need clarification, as identified by the public in past Public ICWGs. b) There were some administrative errors found during the UpRev process of the public documents. c) Contractor signatories are required for government-controlled documents.

(Pre-RFCs 819, 861)

Description of Change:

1. Modify the OA as agreed to in ICD-GPS-240 and ICD-GPS-870.
2. a) Provide clarity for the list of signal-in-space topics identified by the public. b) Clean up identified administrative changes in all public documents. c) Remove required contractor signatories from government-controlled documents.

Authored By: Philip Kwan **Checked By: Jennifer Lemus**

AUTHORIZED SIGNATURES	REPRESENTING	DATE
[signature] 4MAR19 DSL	GPS Directorate Space & Missile Systems Center (SMC) – LAAFB	4MAR19

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	CODE IDENT 66RP1

Clean-Up and Clarification Proposed Changes

IS200-1403 :

Section Number :
3.2.1.1.1.0-1

WAS :
An expanded set of 26 P-code PRN sequences are generated by circularly shifting 26 of the original 37 sequences (over one week) by an amount corresponding to 1 day. These expanded sequences are therefore time shifted (i.e. offset) versions of 26 of the original sequences. Assignment of these expanded code phase segments by SV ID number is given in Table 3-Ib. Additional PRN P-code sequences with assigned PRN numbers are provided in Section 6.3.6, Table 6-I.

Redlines :
An expanded set of 26 P-code PRN sequences are generated by circularly shifting 26 of the original 37 sequences (over one week) by an amount corresponding to 1 day. These expanded sequences are therefore time shifted (i.e. offset) versions of 26 of the original sequences. Assignment of these expanded code phase segments by SV ID number is given in Table 3-Ib. Additional PRN P-code sequences with assigned PRN numbers are provided in Section 6.3.6.2.1, Table 6-I.

IS :
An expanded set of 26 P-code PRN sequences are generated by circularly shifting 26 of the original 37 sequences (over one week) by an amount corresponding to 1 day. These expanded sequences are therefore time shifted (i.e. offset) versions of 26 of the original sequences. Assignment of these expanded code phase segments by SV ID number is given in Table 3-Ib. Additional PRN P-code sequences with assigned PRN numbers are provided in Section 6.3.6.2.1, Table 6-I.

IS200-1316 :

Section Number :
3.2.1.3.1.0-1

WAS :
An expanded set of 26 C/A-code PRN sequences are identified in Table 3-Ib using “G2 Delay” and “Initial G2 Setting” which is not the same as the method used in Table 3-Ia. The two-tap coder implementation method referenced and used in Table 3-Ia is not used in Table 3-Ib due to its limitation in generating C/A-code sequences. The “G2 Delay” specified in Table 3-Ib may be accomplished by using the “Initial G2 Setting” as the initialization vector for the G2 shift register of Figure 3-9. Assignment of these expanded code phase segments by SV ID number is given in Table 3-Ib. Additional PRN C/A-code sequences with assigned PRN numbers are provided in Section 6.3.6.1, Table 6-I.

Redlines :
An expanded set of 26 C/A-code PRN sequences are identified in Table 3-Ib using “G2 Delay” and “Initial G2 Setting” which is not the same as the method used in Table 3-Ia. The two-tap coder implementation method referenced and used in Table 3-Ia is not used in Table 3-Ib due to its limitation in generating C/A-code sequences. The “G2 Delay” specified in Table 3-Ib may be accomplished by using the “Initial G2 Setting” as the initialization vector for the G2 shift register of Figure 3-9. Assignment of these expanded code phase segments by SV ID number is given in Table 3-Ib. Additional PRN C/A-code sequences with assigned PRN numbers are provided in Section 6.3.6.2.1, Table 6-I.

IS :
An expanded set of 26 C/A-code PRN sequences are identified in Table 3-Ib using “G2 Delay” and “Initial G2 Setting” which is not the same as the method used in Table 3-Ia. The two-tap coder implementation method referenced and used in Table 3-Ia is not used in Table 3-Ib due to its limitation in generating C/A-code sequences. The “G2 Delay” specified in Table 3-Ib may be accomplished by using the “Initial G2 Setting” as the initialization vector for the G2 shift register of Figure 3-9. Assignment of these expanded code phase segments by SV ID number is given in Table 3-Ib. Additional PRN C/A-code sequences with assigned PRN numbers are provided in Section 6.3.6.2.1, Table 6-I.

IS200-34 :

Section Number :
3.2.1.5.1.0-3

WAS :

Table 3-Ia. Code Phase Assignments (sheet 1 of 2)

SV ID No.	GPS PRN Signal No.	Code Phase Selection		Code Delay Chips		First 10 Chips Octal* C/A	First 12 Chips Octal P
		C/A($G2_i$)***	($X2_i$)	C/A	P		
1	1	2 ⊕ 6	1	5	1	1440	4444
2	2	3 ⊕ 7	2	6	2	1620	4000
3	3	4 ⊕ 8	3	7	3	1710	4222
4	4	5 ⊕ 9	4	8	4	1744	4333
5	5	1 ⊕ 9	5	17	5	1133	4377
6	6	2 ⊕ 10	6	18	6	1455	4355
7	7	1 ⊕ 8	7	139	7	1131	4344
8	8	2 ⊕ 9	8	140	8	1454	4340
9	9	3 ⊕ 10	9	141	9	1626	4342
10	10	2 ⊕ 3	10	251	10	1504	4343
11	11	3 ⊕ 4	11	252	11	1642	
12	12	5 ⊕ 6	12	254	12	1750	
13	13	6 ⊕ 7	13	255	13	1764	
14	14	7 ⊕ 8	14	256	14	1772	
15	15	8 ⊕ 9	15	257	15	1775	
16	16	9 ⊕ 10	16	258	16	1776	
17	17	1 ⊕ 4	17	469	17	1156	
18	18	2 ⊕ 5	18	470	18	1467	
19	19	3 ⊕ 6	19	471	19	1633	4343

* In the octal notation for the first 10 chips of the C/A-code as shown in this column, the first digit (1) represents a "1" 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. 1 are: 1100100000).

** C/A-codes for 34 and 37 are identical.

*** The two-tap coder utilized here is only an example implementation that generates a limited set of valid C/A-codes.

⊕ = "exclusive or"

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.

Redlines :

Table 3-Ia. Code Phase Assignments (sheet 1 of 2)

SV ID No.	GPS PRN Signal No.	Code Phase Selection		Code Delay Chips		First 10 Chips Octal* C/A	First 12 Chips Octal P
		C/A($G2_i$)***	($X2_i$)	C/A	P		
1	1	2 ⊕ 6	1	5	1	1440	4444
2	2	3 ⊕ 7	2	6	2	1620	4000
3	3	4 ⊕ 8	3	7	3	1710	4222
4	4	5 ⊕ 9	4	8	4	1744	4333
5	5	1 ⊕ 9	5	17	5	1133	4377
6	6	2 ⊕ 10	6	18	6	1455	4355
7	7	1 ⊕ 8	7	139	7	1131	4344
8	8	2 ⊕ 9	8	140	8	1454	4340
9	9	3 ⊕ 10	9	141	9	1626	4342
10	10	2 ⊕ 3	10	251	10	1504	4343
11	11	3 ⊕ 4	11	252	11	1642	
12	12	5 ⊕ 6	12	254	12	1750	
13	13	6 ⊕ 7	13	255	13	1764	
14	14	7 ⊕ 8	14	256	14	1772	
15	15	8 ⊕ 9	15	257	15	1775	
16	16	9 ⊕ 10	16	258	16	1776	
17	17	1 ⊕ 4	17	469	17	1156	
18	18	2 ⊕ 5	18	470	18	1467	
19	19	3 ⊕ 6	19	471	19	1633	4343

* In the octal notation for the first 10 chips of the C/A code as shown in this column, the first digit (1) represents a "1" 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. 1 are: 1100100000).

~~** C/A codes for 34 and 37 are identical.~~

*** The two-tap coder utilized here is only an example implementation that generates a limited set of valid C/A codes.

⊕ = "exclusive or"

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.

Table 3-Ia. Code Phase Assignments (sheet 1 of 2)

SV ID No.	GPS PRN Signal No.	Code Phase Selection		Code Delay Chips		First 10 Chips Octal* C/A	First 12 Chips Octal P
		C/A($G2_i$)**	($X2_i$)	C/A	P		
1	1	2 ⊕ 6	1	5	1	1440	4444
2	2	3 ⊕ 7	2	6	2	1620	4000
3	3	4 ⊕ 8	3	7	3	1710	4222
4	4	5 ⊕ 9	4	8	4	1744	4333
5	5	1 ⊕ 9	5	17	5	1133	4377
6	6	2 ⊕ 10	6	18	6	1455	4355
7	7	1 ⊕ 8	7	139	7	1131	4344
8	8	2 ⊕ 9	8	140	8	1454	4340
9	9	3 ⊕ 10	9	141	9	1626	4342
10	10	2 ⊕ 3	10	251	10	1504	4343
11	11	3 ⊕ 4	11	252	11	1642	
12	12	5 ⊕ 6	12	254	12	1750	
13	13	6 ⊕ 7	13	255	13	1764	
14	14	7 ⊕ 8	14	256	14	1772	
15	15	8 ⊕ 9	15	257	15	1775	
16	16	9 ⊕ 10	16	258	16	1776	
17	17	1 ⊕ 4	17	469	17	1156	
18	18	2 ⊕ 5	18	470	18	1467	
19	19	3 ⊕ 6	19	471	19	1633	4343

* In the octal notation for the first 10 chips of the C/A code as shown in this column, the first digit (1) represents a "1" 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. 1 are: 1100100000).

** The two-tap coder utilized here is only an example implementation that generates a limited set of valid C/A codes.

⊕ = "exclusive or"

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.

IS200-35 :

Section Number :
3.2.1.5.1.0-5

WAS :

Table 3-1a. Code Phase Assignments (sheet 2 of 2)

SV ID No.	GPS PRN Signal No.	Code Phase Selection		Code Delay Chips		First 10 Chips Octal* C/A	First 12 Chips Octal P
		C/A($G2_i$)****	($X2_i$)	C/A	P		
20	20	4 ⊕ 7	20	472	20	1715	4343
21	21	5 ⊕ 8	21	473	21	1746	│
22	22	6 ⊕ 9	22	474	22	1763	│
23	23	1 ⊕ 3	23	509	23	1063	│
24	24	4 ⊕ 6	24	512	24	1706	│
25	25	5 ⊕ 7	25	513	25	1743	│
26	26	6 ⊕ 8	26	514	26	1761	│
27	27	7 ⊕ 9	27	515	27	1770	│
28	28	8 ⊕ 10	28	516	28	1774	│
29	29	1 ⊕ 6	29	859	29	1127	│
30	30	2 ⊕ 7	30	860	30	1453	│
31	31	3 ⊕ 8	31	861	31	1625	│
32	32	4 ⊕ 9	32	862	32	1712	│
65	33***	5 ⊕ 10	33	863	33	1745	│
66	34**	4 ⊕ 10	34	950	34	1713	│
67	35	1 ⊕ 7	35	947	35	1134	│
68	36	2 ⊕ 8	36	948	36	1456	│
69	37**	4 ⊕ 10	37	950	37	1713	4343

* In the octal notation for the first 10 chips of the C/A-code as shown in this column, the first digit (1) represents a "1" 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. 1 are: 1100100000).

** C/A-codes 34 and 37are identical.

*** PRN sequence 33 is reserved for other uses (e.g. ground transmitters).

**** The two-tap coder utilized here is only an example implementation that generates a limited set of valid C/A-codes.

⊕ = "exclusive or"

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.

Redlines :

Table 3-1a. Code Phase Assignments (sheet 2 of 2)

SV ID No.	GPS PRN Signal No.	Code Phase Selection C/A(G2ᵢ)****	Code Phase Selection (X2ᵢ)	Code Delay Chips C/A	Code Delay Chips P	First 10 Chips Octal* C/A	First 12 Chips Octal P
20	20	4 ⊕ 7	20	472	20	1715	4343
21	21	5 ⊕ 8	21	473	21	1746	│
22	22	6 ⊕ 9	22	474	22	1763	│
23	23	1 ⊕ 3	23	509	23	1063	│
24	24	4 ⊕ 6	24	512	24	1706	│
25	25	5 ⊕ 7	25	513	25	1743	│
26	26	6 ⊕ 8	26	514	26	1761	│
27	27	7 ⊕ 9	27	515	27	1770	│
28	28	8 ⊕ 10	28	516	28	1774	│
29	29	1 ⊕ 6	29	859	29	1127	│
30	30	2 ⊕ 7	30	860	30	1453	│
31	31	3 ⊕ 8	31	861	31	1625	│
32	32	4 ⊕ 9	32	862	32	1712	│
65	33***	5 ⊕ 10	33	863	33	1745	│
66	34**	4 ⊕ 10	34	950	34	1713	│
67	35	1 ⊕ 7	35	947	35	1134	│
68	36	2 ⊕ 8	36	948	36	1456	│
69	37**	4 ⊕ 10	37	950	37	1713	4343

* In the octal notation for the first 10 chips of the C/A-code as shown in this column, the first digit (1) represents a "1" 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. 1 are: 1100100000).

** C/A-codes 34 and 37 are identical.

*** PRN sequence 33 is reserved for other uses (e.g. ground transmitters).

**** The two-tap coder utilized here is only an example implementation that generates a limited set of valid C/A-codes.

⊕ = "exclusive or"

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.

[Left alignment]

Table 3-1a. Code Phase Assignments (sheet 2 of 2)

SV ID No.	GPS PRN Signal No.	Code Phase Selection		Code Delay Chips		First 10 Chips Octal* C/A	First 12 Chips Octal P
		C/A($G2_i$)****	($X2_i$)	C/A	P		
20	20	4 ⊕ 7	20	472	20	1715	4343
21	21	5 ⊕ 8	21	473	21	1746	│
22	22	6 ⊕ 9	22	474	22	1763	│
23	23	1 ⊕ 3	23	509	23	1063	│
24	24	4 ⊕ 6	24	512	24	1706	│
25	25	5 ⊕ 7	25	513	25	1743	│
26	26	6 ⊕ 8	26	514	26	1761	│
27	27	7 ⊕ 9	27	515	27	1770	│
28	28	8 ⊕ 10	28	516	28	1774	│
29	29	1 ⊕ 6	29	859	29	1127	│
30	30	2 ⊕ 7	30	860	30	1453	│
31	31	3 ⊕ 8	31	861	31	1625	│
32	32	4 ⊕ 9	32	862	32	1712	│
65	33***	5 ⊕ 10	33	863	33	1745	│
66	34**	4 ⊕ 10	34	950	34	1713	│
67	35	1 ⊕ 7	35	947	35	1134	│
68	36	2 ⊕ 8	36	948	36	1456	│
69	37**	4 ⊕ 10	37	950	37	1713	4343

* In the octal notation for the first 10 chips of the C/A-code as shown in this column, the first digit (1) represents a "1" 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. 1 are: 1100100000).

** C/A-codes 34 and 37 are identical.

*** PRN sequence 33 is reserved for other uses (e.g. ground transmitters).

**** The two-tap coder utilized here is only an example implementation that generates a limited set of valid C/A-codes.

⊕ = "exclusive or"

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.

IS200-42 :

Section Number :
3.2.2.0-1

WAS :
The NAV data, D(t), includes SV ephemerides, system time, SV clock behavior data, status messages and C/A to P (or Y) code handover information, etc. The 50 bps data is modulo-2 added to the P(Y)- and C/A- codes; the resultant bit-trains are used to modulate the L1 and L2 carriers. For a given SV, the data train D(t), if present, is common to the P(Y)- and C/A- codes on both the L1 and L2 channels. The content and characteristics of the NAV data, D(t), are given in Appendix II of this document for legacy NAV (LNAV) data transmitted by SVs assigned to the lower set of PRN numbers (PRN 1-32) and Appendix IV of this document for LNAV data transmitted by SVs assigned to the upper set of PRN numbers (PRN 33-63).

Redlines :
The ~~NAV~~legacy navigation (LNAV) data, D(t), includes SV ephemerides, system time, SV clock behavior data, status messages and C/A to P (or Y) code handover information, etc. The 50 bps data is modulo-2 added to the P(Y)- and C/A- codes; the resultant bit-trains are used to modulate the L1 and L2 carriers. For a given SV, the data train D(t), if present, is common to the P(Y)- and C/A- codes on both the L1 and L2 channels. The content and characteristics of the ~~NAV~~LNAV data, D(t), are given in Appendix II of this document for ~~legacy NAV (~~LNAV~~)~~ data transmitted by SVs assigned to the lower set of PRN numbers (PRN 1-32) and Appendix IV of this document for LNAV data transmitted by SVs assigned to the upper set of PRN numbers (PRN 33-63).

IS :
The legacy navigation (LNAV) data, D(t), includes SV ephemerides, system time, SV clock behavior data, status messages and C/A to P (or Y) code handover information, etc. The 50 bps data is modulo-2 added to the P(Y)- and C/A- codes; the resultant bit-trains are used to modulate the L1 and L2 carriers. For a given SV, the data train D(t), if present, is common to the P(Y)- and C/A- codes on both the L1 and L2 channels. The content and characteristics of the LNAV data, D(t), are given in Appendix II of this document for LNAV data transmitted by SVs assigned to the lower set of PRN numbers (PRN 1-32) and Appendix IV of this document for LNAV data transmitted by SVs assigned to the upper set of PRN numbers (PRN 33-63).

IS200-46 :

Section Number :
3.2.3.0-1

WAS :
The L1 consists of two carrier components which are in phase quadrature with each other. Each carrier component is bi-phase shift key (BPSK) modulated by a separate bit train. One bit train is the modulo-2 sum of the P(Y)-code and NAV data, D(t), while the other is the modulo-2 sum of the C/A-code and the NAV data, D(t). For Block II/IIA and IIR, the L2 is BPSK modulated by only one of those two bit trains; the bit train to be used for L2 modulation is selected by ground command. A third modulation mode is also selectable on the L2 channel by ground command: it utilizes the P(Y)-code without the NAV data as the modulating signal. For a particular SV, all transmitted signal elements (carriers, codes and data) are coherently derived from the same on-board frequency source.

Redlines :
The L1 consists of two carrier components which are in phase quadrature with each other. Each carrier component is bi-phase shift key (BPSK) modulated by a separate bit train. One bit train is the modulo-2 sum of the P(Y)-code and ~~NAV~~LNAV data, D(t), while the other is the modulo-2 sum of the C/A-code and the ~~NAV~~LNAV data, D(t). For Block II/IIA and IIR, the L2 is BPSK modulated by only one of those two bit trains; the bit train to be used for L2 modulation is selected by ground command. A third modulation mode is also selectable on the L2 channel by ground command: it utilizes the P(Y)-code without the ~~NAV~~LNAV data as the modulating signal. For a particular SV, all transmitted signal elements (carriers, codes and data) are coherently derived from the same on-board frequency source.

IS :
The L1 consists of two carrier components which are in phase quadrature with each other. Each carrier component is bi-phase shift key (BPSK) modulated by a separate bit train. One bit train is the modulo-2 sum of the P(Y)-code and LNAV data, D(t), while the other is the modulo-2 sum of the C/A-code and the LNAV data, D(t). For Block II/IIA and IIR, the L2 is BPSK modulated by only one of those two bit trains; the bit train to be used for L2 modulation is selected by ground command. A third modulation mode is also selectable on the L2 channel by ground command: it utilizes the P(Y)-code without the LNAV data as the modulating signal. For a particular SV, all transmitted signal elements (carriers, codes and data) are coherently derived from the same on-board frequency source.

IS200-47 :

Section Number :
3.2.3.0-2

WAS :
For Block IIR-M, Block IIF, and subsequent blocks of SVs, the L2 consists of two carrier components. One carrier component is BPSK modulated by the bit train which is the modulo-2 sum of the P(Y)-code with or without NAV data D(t), while the other is BPSK modulated by any one of three other bit trains which are selectable by ground command. The three possible bit trains are: (1) the modulo-2 sum of the C/A-code and D(t); (2) the C/A-code with no data and; (3) a chip-by-chip time multiplex combination of bit trains consisting of the L2 CM-code with $D_C(t)$ and the L2 CL-code with no data. The L2 CM-code with the 50 sps symbol stream of $D_C(t)$ is time-multiplexed with L2 CL-code at a 1023 kHz rate as described in paragraph 3.2.2. The first L2 CM-code chip starts synchronously with the end/start of week epoch.

Redlines :
For Block IIR-M, Block IIF, and subsequent blocks of SVs, the L2 consists of two carrier components. One carrier component is BPSK modulated by the bit train which is the modulo-2 sum of the P(Y)-code with or without ~~NAV~~LNAV data D(t), while the other is BPSK modulated by any one of three other bit trains which are selectable by ground command. The three possible bit trains are: (1) the modulo-2 sum of the C/A-code and D(t); (2) the C/A-code with no data and; (3) a chip-by-chip time multiplex combination of bit trains consisting of the L2 CM-code with $D_C(t)$ and the L2 CL-code with no data. The L2 CM-code with the 50 sps symbol stream of $D_C(t)$ is time-multiplexed with L2 CL-code at a 1023 kHz rate as described in paragraph 3.2.2. The first L2 CM-code chip starts synchronously with the end/start of week epoch.

IS :
For Block IIR-M, Block IIF, and subsequent blocks of SVs, the L2 consists of two carrier components. One carrier component is BPSK modulated by the bit train which is the modulo-2 sum of the P(Y)-code with or without LNAV data D(t), while the other is BPSK modulated by any one of three other bit trains which are selectable by ground command. The three possible bit trains are: (1) the modulo-2 sum of the C/A-code and D(t); (2) the C/A-code with no data and; (3) a chip-by-chip time multiplex combination of bit trains consisting of the L2 CM-code with $D_C(t)$ and the L2 CL-code with no data. The L2 CM-code with the 50 sps symbol stream of $D_C(t)$ is time-multiplexed with L2 CL-code at a 1023 kHz rate as described in paragraph 3.2.2. The first L2 CM-code chip starts synchronously with the end/start of week epoch.

IS200-50 :

Section Number :
3.2.3.1-3

WAS :

SV Blocks	L1		L2**	
	In-Phase*	Quadrature-Phase*	In-Phase*	Quadrature-Phase*
Block II/IIA/IIR	P(Y) ⊕ D(t)	C/A ⊕ D(t)	P(Y) ⊕ D(t) or P(Y) or C/A ⊕ D(t)	Not Applicable
Block IIR-M/IIF/ and GPS III	P(Y) ⊕ D(t)	C/A ⊕ D(t)	P(Y) ⊕ D(t) or P(Y)	L2 CM ⊕ $D_C(t)$ with L2 CL or C/A ⊕ D(t) or C/A

Notes: 1) The configuration identified in this table reflects only the content of Section 3.2.3 and does not show all available codes/signals on L1/L2.

⊕ = "exclusive-or" (modulo-2 addition)
D(t) = NAV data at 50 bps
$D_C(t)$ = CNAV data at 25 bps with FEC encoding resulting in 50 sps

* Terminology of "in-phase" and "quadrature-phase" is used only to identify the relative phase quadrature relationship of the carrier components (i.e. 90 degrees offset of each other).

** The two carrier components on L2 may not have the phase quadrature relationship. They may be broadcast on same phase (ref. Section 3.3.1.5).

Redlines :

SV Blocks	L1		L2**	
	In-Phase*	Quadrature-Phase*	In-Phase*	Quadrature-Phase*
Block II/IIA/IIR	P(Y) ⊕ D(t)	C/A ⊕ D(t)	P(Y) ⊕ D(t) or P(Y) or C/A ⊕ D(t)	Not Applicable
Block IIR-M/IIF/ and GPS III	P(Y) ⊕ D(t)	C/A ⊕ D(t)	P(Y) ⊕ D(t) or P(Y)	L2 CM ⊕ D_C(t) with L2 CL or C/A ⊕ D(t) or C/A

Notes: 1) The configuration identified in this table reflects only the content of Section 3.2.3 and does not show all available codes/signals on L1/L2.

⊕ = "exclusive-or" (modulo-2 addition)
D(t) = LNAV data at 50 bps
D_C(t) = CNAV data at 25 bps with FEC encoding resulting in 50 sps

* Terminology of "in-phase" and "quadrature-phase" is used only to identify the relative phase quadrature relationship of the carrier components (i.e. 90 degrees offset of each other).

** The two carrier components on L2 may not have the phase quadrature relationship. They may be broadcast on same phase (ref. Section 3.3.1.5).

SV Blocks	L1		L2**	
	In-Phase*	Quadrature-Phase*	In-Phase*	Quadrature-Phase*
Block II/IIA/IIR	P(Y) ⊕ D(t)	C/A ⊕ D(t)	P(Y) ⊕ D(t) or P(Y) or C/A ⊕ D(t)	Not Applicable
Block IIR-M/IIF/ and GPS III	P(Y) ⊕ D(t)	C/A ⊕ D(t)	P(Y) ⊕ D(t) or P(Y)	L2 CM ⊕ D_C(t) with L2 CL or C/A ⊕ D(t) or C/A

Notes: 1) The configuration identified in this table reflects only the content of Section 3.2.3 and does not show all available codes/signals on L1/L2.

⊕ = "exclusive-or" (modulo-2 addition)
D(t) = LNAV data at 50 bps
D_C(t) = CNAV data at 25 bps with FEC encoding resulting in 50 sps

* Terminology of "in-phase" and "quadrature-phase" is used only to identify the relative phase quadrature relationship of the carrier components (i.e. 90 degrees offset of each other).

** The two carrier components on L2 may not have the phase quadrature relationship. They may be broadcast on same phase (ref. Section 3.3.1.5).

IS200-83 :

Section Number :
3.3.1.7.0-1

WAS :
Equipment group delay is defined as the delay between the signal radiated output of a specific SV (measured at the antenna phase center) and the output of that SV's on-board frequency source; the delay consists of a bias term and an uncertainty. The bias term is of no concern to the US since it is included in the clock correction parameters relayed in the NAV data, and is therefore accounted for by the user computations of system time (reference paragraphs 20.3.3.3.3.1, 30.3.3.2.3). The uncertainty (variation) of this delay as well as the group delay differential between the signals of L1 and L2 are defined in the following.

Redlines :
Equipment group delay is defined as the delay between the signal radiated output of a specific SV (measured at the antenna phase center) and the output of that SV's on-board frequency source; the delay consists of a bias term and an uncertainty. The bias term is of no concern to the US since it is included in the clock correction parameters relayed in the ~~NAV~~LNAV/CNAV data, and is therefore accounted for by the user computations of system time (reference paragraphs 20.3.3.3.3.1, 30.3.3.2.3). The uncertainty (variation) of this delay as well as the group delay differential between the signals of L1 and L2 are defined in the following.

IS :
Equipment group delay is defined as the delay between the signal radiated output of a specific SV (measured at the antenna phase center) and the output of that SV's on-board frequency source; the delay consists of a bias term and an uncertainty. The bias term is of no concern to the US since it is included in the clock correction parameters relayed in the LNAV/CNAV data, and is therefore accounted for by the user computations of system time (reference paragraphs 20.3.3.3.3.1, 30.3.3.2.3). The uncertainty (variation) of this delay as well as the group delay differential between the signals of L1 and L2 are defined in the following.

IS200-87 :

Section Number :
3.3.1.7.2.0-1

WAS :
The group delay differential between the radiated L1 and L2 signals (i.e. L1 P(Y) and L2 P(Y), L1 P(Y) and L2C) is specified as consisting of random plus bias components. The mean differential is defined as the bias component and will be either positive or negative. For a given navigation payload redundancy configuration, the absolute value of the mean differential delay shall not exceed 15.0 nanoseconds. The random plus non-random variations about the mean shall not exceed 3.0 nanoseconds (95% probability), when including consideration of the temperature and antenna effects during a vehicle orbital revolution. Corrections for the bias components of the group delay differential are provided to the US in the NAV/CNAV message using parameters designated as T_{GD} (reference paragraph 20.3.3.3.3.2) and Inter-Signal Correction (ISC) (reference paragraph 30.3.3.3.1.1).

Redlines :
The group delay differential between the radiated L1 and L2 signals (i.e. L1 P(Y) and L2 P(Y), L1 P(Y) and L2C) is specified as consisting of random plus bias components. The mean differential is defined as the bias component and will be either positive or negative. For a given navigation payload redundancy configuration, the absolute value of the mean differential delay shall not exceed 15.0 nanoseconds. The random plus non-random variations about the mean shall not exceed 3.0 nanoseconds (95% probability), when including consideration of the temperature and antenna effects during a vehicle orbital revolution. Corrections for the bias components of the group delay differential are provided to the US in the ~~NAV~~LNAV/CNAV message using parameters designated as T_{GD} (reference paragraph 20.3.3.3.3.2) and Inter-Signal Correction (ISC) (reference paragraph 30.3.3.3.1.1).

IS :
The group delay differential between the radiated L1 and L2 signals (i.e. L1 P(Y) and L2 P(Y), L1 P(Y) and L2C) is specified as consisting of random plus bias components. The mean differential is defined as the bias component and will be either positive or negative. For a given navigation payload redundancy configuration, the absolute value of the mean differential delay shall not exceed 15.0 nanoseconds. The random plus non-random variations about the mean shall not exceed 3.0 nanoseconds (95% probability), when including consideration of the temperature and antenna effects during a vehicle orbital revolution. Corrections for the bias components of the group delay differential are provided to the US in the LNAV/CNAV message using parameters designated as T_{GD} (reference paragraph 20.3.3.3.3.2) and Inter-Signal Correction (ISC) (reference paragraph 30.3.3.3.1.1).

IS200-95 :

Section Number :
3.3.2.0-1

WAS :
The characteristics of the P-, L2 CM-, L2 CL-, and the C/A-codes are defined below in terms of their structure and the basic method used for generating them. Figure 3-1 depicts a simplified block diagram of the scheme for generating the 10.23 Mbps $P_i(t)$ and the 1.023 Mbps $G_i(t)$ patterns (referred to as P- and C/A-codes respectively), and for modulo-2 summing these patterns with the NAV bit train, D(t), which is clocked at 50 bps. The resultant composite bit trains are then used to modulate the signal carriers.

Redlines :
The characteristics of the P-, L2 CM-, L2 CL-, and the C/A-codes are defined below in terms of their structure and the basic method used for generating them. Figure 3-1 depicts a simplified block diagram of the scheme for generating the 10.23 Mbps $P_i(t)$ and the 1.023 Mbps $G_i(t)$ patterns (referred to as P- and C/A-codes respectively), and for modulo-2 summing these patterns with the ~~NAV~~LNAV bit train, D(t), which is clocked at 50 bps. The resultant composite bit trains are then used to modulate the signal carriers.

IS :
The characteristics of the P-, L2 CM-, L2 CL-, and the C/A-codes are defined below in terms of their structure and the basic method used for generating them. Figure 3-1 depicts a simplified block diagram of the scheme for generating the 10.23 Mbps $P_i(t)$ and the 1.023 Mbps $G_i(t)$ patterns (referred to as P- and C/A-codes respectively), and for modulo-2 summing these patterns with the LNAV bit train, D(t), which is clocked at 50 bps. The resultant composite bit trains are then used to modulate the signal carriers.

IS200-140 :

Section Number :
3.3.3.1.1.0-1

WAS :
The CNAV bit train, $D_C(t)$, will always be Forward Error Correction (FEC) encoded by a rate ½ convolutional code. For Block IIR-M, the NAV bit train, D(t), can be selected to be convolutionally encoded. The resulting symbol rate is 50 sps. The convolutional coding will be constraint length 7, with a convolutional encoder logic arrangement as illustrated in Figure 3-14. The G1 symbol is selected on the output as the first half of a 40-millisecond data bit period.

Redlines :
The CNAV bit train, $D_C(t)$, will always be Forward Error Correction (FEC) encoded by a rate ½ convolutional code. For Block IIR-M, the ~~NAV~~LNAV bit train, D(t), can be selected to be convolutionally encoded. The resulting symbol rate is 50 sps. The convolutional coding will be constraint length 7, with a convolutional encoder logic arrangement as illustrated in Figure 3-14. The G1 symbol is selected on the output as the first half of a 40-millisecond data bit period.

IS :
The CNAV bit train, $D_C(t)$, will always be Forward Error Correction (FEC) encoded by a rate ½ convolutional code. For Block IIR-M, the LNAV bit train, D(t), can be selected to be convolutionally encoded. The resulting symbol rate is 50 sps. The convolutional coding will be constraint length 7, with a convolutional encoder logic arrangement as illustrated in Figure 3-14. The G1 symbol is selected on the output as the first half of a 40-millisecond data bit period.

IS200-147 :

Section Number :
3.3.4.0-2

WAS :
The NAV data contains the requisite data for relating GPS time to UTC. The accuracy of this data during the transmission interval shall be such that it relates GPS time (maintained by the MCS of the CS) to UTC (USNO) within 20 nanoseconds (one sigma). This data is generated by the CS; therefore, the accuracy of this relationship may degrade if for some reason the CS is unable to upload data to a SV. At this point, it is assumed that alternate sources of UTC are no longer available, and the relative accuracy of the GPS/UTC relationship will be sufficient for users. Range error components (e.g. SV clock and position) contribute to the GPS time transfer error, and under normal operating circumstances (two frequency time transfers from SV(s) whose navigation message indicates a URA of eight meters or less), this corresponds to a 28 nanosecond (one sigma) apparent uncertainty at the SV. Propagation delay errors and receiver equipment biases unique to the user add to this time transfer uncertainty.

Redlines :
The ~~NAV~~LNAV/CNAV data contains the requisite data for relating GPS time to UTC. The accuracy of this data during the transmission interval shall be such that it relates GPS time (maintained by the MCS of the CS) to UTC (USNO) within 20 nanoseconds (one sigma). This data is generated by the CS; therefore, the accuracy of this relationship may degrade if for some reason the CS is unable to upload data to a SV. At this point, it is assumed that alternate sources of UTC are no longer available, and the relative accuracy of the GPS/UTC relationship will be sufficient for users. Range error components (e.g. SV clock and position) contribute to the GPS time transfer error, and under normal operating circumstances (~~two~~ dual-frequency time transfers from SV(s) whose navigation message indicates a URA of eight meters or less), this corresponds to a 28 nanosecond (one sigma) apparent uncertainty at the SV. Propagation delay errors and receiver equipment biases unique to the user add to this time transfer uncertainty.

IS :
The LNAV/CNAV data contains the requisite data for relating GPS time to UTC. The accuracy of this data during the transmission interval shall be such that it relates GPS time (maintained by the MCS of the CS) to UTC (USNO) within 20 nanoseconds (one sigma). This data is generated by the CS; therefore, the accuracy of this relationship may degrade if for some reason the CS is unable to upload data to a SV. At this point, it is assumed that alternate sources of UTC are no longer available, and the relative accuracy of the GPS/UTC relationship will be sufficient for users. Range error components (e.g. SV clock and position) contribute to the GPS time transfer error, and under normal operating circumstances (dual-frequency time transfers from SV(s) whose navigation message indicates a URA of eight meters or less), this corresponds to a 28 nanosecond (one sigma) apparent uncertainty at the SV. Propagation delay errors and receiver equipment biases unique to the user add to this time transfer uncertainty.

IS200-148 :

Section Number :
3.3.4.0-3

WAS :
In each SV the X1 epochs of the P-code offer a convenient unit for precisely counting and communicating time. Time stated in this manner is referred to as Z-count, which is given as a binary number consisting of two parts as follows:

a. The binary number represented by the 19 least significant bits of the Z-count is referred to as the time of week (TOW) count and is defined as being equal to the number of X1 epochs that have occurred since the transition from the previous week. The count is short-cycled such that the range of the TOW-count is from 0 to 403,199 X1 epochs (equaling one week) and is reset to zero at the end of each week. The TOW-count's zero state is defined as that X1 epoch which is coincident with the start of the present week. This epoch occurs at (approximately) midnight Saturday night-Sunday morning, where midnight is defined as 0000 hours on the UTC scale which is nominally referenced to the Greenwich Meridian. Over the years the occurrence of the "zero state epoch" may differ by a few seconds from 0000 hours on the UTC scale since UTC is periodically corrected with leap seconds while the TOW-count is continuous without such correction. To aid rapid ground lock-on to the P-code signal, a truncated version of the TOW-count, consisting of its 17 most significant bits, is contained in the hand-over word (HOW) of the L1 and L2 NAV data (D(t)) stream; the relationship between the actual TOW-count and its truncated HOW version is illustrated by Figure 3-16.

Redlines :
In each SV the X1 epochs of the P-code offer a convenient unit for precisely counting and communicating time. Time stated in this manner is referred to as Z-count, which is given as a binary number consisting of two parts as follows:

a. The binary number represented by the 19 least significant bits of the Z-count is referred to as the time of week (TOW) count and is defined as being equal to the number of X1 epochs that have occurred since the transition from the previous week. The count is short-cycled such that the range of the TOW-count is from 0 to 403,199 X1 epochs (equaling one week) and is reset to zero at the end of each week. The TOW-count's zero state is defined as that X1 epoch which is coincident with the start of the present week. This epoch occurs at (approximately) midnight Saturday night-Sunday morning, where midnight is defined as 0000 hours on the UTC scale which is nominally referenced to the Greenwich Meridian. Over the years the occurrence of the "zero state epoch" may differ by a few seconds from 0000 hours on the UTC scale since UTC is periodically corrected with leap seconds while the TOW-count is continuous without such correction. To aid rapid ground lock-on to the P-code signal, a truncated version of the TOW-count, consisting of its 17 most significant bits, is contained in the hand-over word (HOW) of the L1 and L2 ~~NAV~~LNAV data (D(t)) stream; the relationship between the actual TOW-count and its truncated HOW version is illustrated by Figure 3-16.

IS :
In each SV the X1 epochs of the P-code offer a convenient unit for precisely counting and communicating time. Time stated in this manner is referred to as Z-count, which is given as a binary number consisting of two parts as follows:

a. The binary number represented by the 19 least significant bits of the Z-count is referred to as the time of week (TOW) count and is defined as being equal to the number of X1 epochs that have occurred since the transition from the previous week. The count is short-cycled such that the range of the TOW-count is from 0 to 403,199 X1 epochs (equaling one week) and is reset to zero at the end of each week. The TOW-count's zero state is defined as that X1 epoch which is coincident with the start of the present week. This epoch occurs at (approximately) midnight Saturday night-Sunday morning, where midnight is defined as 0000 hours on the UTC scale which is nominally referenced to the Greenwich Meridian. Over the years the occurrence of the "zero state epoch" may differ by a few seconds from 0000 hours on the UTC scale since UTC is periodically corrected with leap seconds while the TOW-count is continuous without such correction. To aid rapid ground lock-on to the P-code signal, a truncated version of the TOW-count, consisting of its 17 most significant bits, is contained in the hand-over word (HOW) of the L1 and L2 LNAV data (D(t)) stream; the relationship between the actual TOW-count and its truncated HOW version is illustrated by Figure 3-16.

IS200-1488 :

Section Number :
6.1.0-1

WAS :

AI	-	Availability Indicator
AODO	-	Age of Data Offset
A-S	-	Anti-Spoofing
Autonav	-	Autonomous Navigation
BPSK	-	Bi-Phase Shift Key
CDC	-	Clock Differential Correction
CEI	-	Clock, Ephemeris, Integrity
CNAV	-	Civil Navigation
cps	-	cycles per second
CRC	-	Cyclic Redundancy Check
CS	-	Control Segment
DC	-	Differential Correction
dBc	-	Power ratio of a signal to a (unmodulated) carrier signal, expressed in decibels
dBi	-	Decibel with respect to isotropic antenna
dBW	-	Decibel with respect to 1 W
DN	-	Day Number
EAROM	-	Electrically Alterable Read-Only Memory
ECEF	-	Earth-Centered, Earth-Fixed
ECI	-	Earth-Centered, Inertial
EDC	-	Ephemeris Differential Correction
EOE	-	Edge-of-Earth
EOL	-	End of Life
ERD	-	Estimated Range Deviation
FEC	-	Forward Error Correction
GGTO	-	GPS/GNSS Time Offset
GNSS	-	Global Navigation Satellite System
GPS	-	Global Positioning System

GPSW	-	Global Positioning System Wing
HOW	-	Hand-Over Word
ICC	-	Interface Control Contractor
ID	-	Identification
IERS	-	International Earth Rotation and Reference Systems Service
IODC	-	Issue of Data, Clock
IODE	-	Issue of Data, Ephemeris
IRM	-	IERS Reference Meridian
IRP	-	IERS Reference Pole
IS	-	Interface Specification
ISC	-	Inter-Signal Correction
LSB	-	Least Significant Bit
LSF	-	Leap Seconds Future
L2 C	-	L2 Civil Signal
L2 CL	-	L2 Civil-Long Code
L2 CM	-	L2 Civil-Moderate Code
MCS	-	Master Control Station
MSB	-	Most Significant Bit
NAV	-	Navigation
NDUS	-	NUDET Detection User Segment
NMCT	-	Navigation Message Correction Table
NSC	-	Non-Standard C/A-Code
NSCL	-	Non-Standard L2 CL-Code
NSCM	-	Non-Standard L2 CM-Code
NSY	-	Non-Standard Y-Code
OBCP	-	On-Board Computer Program
OCS	-	Operational Control System
PPS	-	Precise Positioning Service
PRN	-	Pseudo-Random Noise
RF	-	Radio Frequency
RMS	-	Root Mean Square
SA	-	Selective Availability
SEP	-	Spherical Error Probable
SPS	-	Standard Positioning Service

sps	-	symbols per second
SS	-	Space Segment
SSV	-	Space Service Volume
SV	-	Space Vehicle
SVN	-	Space Vehicle Number
TBD	-	To Be Determined
TBS	-	To Be Supplied
TLM	-	Telemetry
TOW	-	Time Of Week
UE	-	User Equipment
URA	-	User Range Accuracy
URE	-	User Range Error
US	-	User Segment
USNO	-	U.S. Naval Observatory
UTC	-	Coordinated Universal Time
WGS 84	-	World Geodetic System 1984
WN	-	Data Sequence Propagation Week Number
WN_e	-	Extended Week Number

Redlines :

AI	-	Availability Indicator
AODO	-	Age of Data Offset
A-S	-	Anti-Spoofing
Autonav	-	Autonomous Navigation
BPSK	-	Bi-Phase Shift Key
CDC	-	Clock Differential Correction
CEI	-	Clock, Ephemeris, Integrity
CNAV	-	Civil Navigation
cps	-	cycles per second
CRC	-	Cyclic Redundancy Check
CS	-	Control Segment
DC	-	Differential Correction

dBc	-	Power ratio of a signal to a (unmodulated) carrier signal, expressed in decibels
dBi	-	Decibel with respect to isotropic antenna
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DN	-	Day Number
EAROM	-	Electrically Alterable Read-Only Memory
ECEF	-	Earth-Centered, Earth-Fixed
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EDC	-	Ephemeris Differential Correction
EOE	-	Edge-of-Earth
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GGTO	-	GPS/GNSS Time Offset
GNSS	-	Global Navigation Satellite System
GPS	-	Global Positioning System
GPSW	-	Global Positioning System Wing
HOW	-	Hand-Over Word
ICC	-	Interface Control Contractor
ID	-	Identification
IERS	-	International Earth Rotation and Reference Systems Service
IODC	-	Issue of Data, Clock
IODE	-	Issue of Data, Ephemeris
IRM	-	IERS Reference Meridian
IRP	-	IERS Reference Pole
IS	-	Interface Specification
ISC	-	Inter-Signal Correction
LNAV	-	Legacy Navigation
LSB	-	Least Significant Bit
LSF	-	Leap Seconds Future
L2C	-	L2 Civil Signal
L2 CL	-	L2 Civil-Long Code
L2 CM	-	L2 Civil-Moderate Code
MCS	-	Master Control Station

MSB	-	Most Significant Bit
NAV	-	Navigation
NDUS	-	NUDET Detection User Segment
NMCT	-	Navigation Message Correction Table
NSC	-	Non-Standard C/A-Code
NSCL	-	Non-Standard L2 CL-Code
NSCM	-	Non-Standard L2 CM-Code
NSY	-	Non-Standard Y-Code
OBCP	-	On-Board Computer Program
OCS	-	Operational Control System
PPS	-	Precise Positioning Service
PRN	-	Pseudo-Random Noise
RF	-	Radio Frequency
RMS	-	Root Mean Square
SA	-	Selective Availability
SEP	-	Spherical Error Probable
SPS	-	Standard Positioning Service
sps	-	symbols per second
SS	-	Space Segment
SSV	-	Space Service Volume
SV	-	Space Vehicle
SVN	-	Space Vehicle Number
TBD	-	To Be Determined
TBS	-	To Be Supplied
TLM	-	Telemetry
TOW	-	Time Of Week
UE	-	User Equipment
URA	-	User Range Accuracy
URE	-	User Range Error
US	-	User Segment
USNO	-	U.S. Naval Observatory
UTC	-	Coordinated Universal Time
WGS 84	-	World Geodetic System 1984
WN	-	Data Sequence Propagation Week Number

WN_e	-	Extended Week Number

IS :

AI	-	Availability Indicator
AODO	-	Age of Data Offset
A-S	-	Anti-Spoofing
Autonav	-	Autonomous Navigation
BPSK	-	Bi-Phase Shift Key
CDC	-	Clock Differential Correction
CEI	-	Clock, Ephemeris, Integrity
CNAV	-	Civil Navigation
cps	-	cycles per second
CRC	-	Cyclic Redundancy Check
CS	-	Control Segment
DC	-	Differential Correction
dBc	-	Power ratio of a signal to a (unmodulated) carrier signal, expressed in decibels
dBi	-	Decibel with respect to isotropic antenna
dBW	-	Decibel with respect to 1 W
DN	-	Day Number
EAROM	-	Electrically Alterable Read-Only Memory
ECEF	-	Earth-Centered, Earth-Fixed
ECI	-	Earth-Centered, Inertial
EDC	-	Ephemeris Differential Correction
EOE	-	Edge-of-Earth
EOL	-	End of Life
ERD	-	Estimated Range Deviation
FEC	-	Forward Error Correction
GGTO	-	GPS/GNSS Time Offset
GNSS	-	Global Navigation Satellite System
GPS	-	Global Positioning System
GPSW	-	Global Positioning System Wing
HOW	-	Hand-Over Word

ICC	-	Interface Control Contractor
ID	-	Identification
IERS	-	International Earth Rotation and Reference Systems Service
IODC	-	Issue of Data, Clock
IODE	-	Issue of Data, Ephemeris
IRM	-	IERS Reference Meridian
IRP	-	IERS Reference Pole
IS	-	Interface Specification
ISC	-	Inter-Signal Correction
LNAV	-	Legacy Navigation
LSB	-	Least Significant Bit
LSF	-	Leap Seconds Future
L2C	-	L2 Civil Signal
L2 CL	-	L2 Civil-Long Code
L2 CM	-	L2 Civil-Moderate Code
MCS	-	Master Control Station
MSB	-	Most Significant Bit
NAV	-	Navigation
NDUS	-	NUDET Detection User Segment
NMCT	-	Navigation Message Correction Table
NSC	-	Non-Standard C/A-Code
NSCL	-	Non-Standard L2 CL-Code
NSCM	-	Non-Standard L2 CM-Code
NSY	-	Non-Standard Y-Code
OBCP	-	On-Board Computer Program
OCS	-	Operational Control System
PPS	-	Precise Positioning Service
PRN	-	Pseudo-Random Noise
RF	-	Radio Frequency
RMS	-	Root Mean Square
SA	-	Selective Availability
SEP	-	Spherical Error Probable
SPS	-	Standard Positioning Service
sps	-	symbols per second

SS	-	Space Segment
SSV	-	Space Service Volume
SV	-	Space Vehicle
SVN	-	Space Vehicle Number
TBD	-	To Be Determined
TBS	-	To Be Supplied
TLM	-	Telemetry
TOW	-	Time Of Week
UE	-	User Equipment
URA	-	User Range Accuracy
URE	-	User Range Error
US	-	User Segment
USNO	-	U.S. Naval Observatory
UTC	-	Coordinated Universal Time
WGS 84	-	World Geodetic System 1984
WN	-	Data Sequence Propagation Week Number
WN_e	-	Extended Week Number

IS200-158 :

Section Number :
6.2.1.0-2

WAS :
Note #1: URA applies over the transmission interval that is applicable to the NAV data from which the URA is read, for the worst-case location within the satellite footprint.

Redlines :
Note #1: URA applies over the transmission interval that is applicable to the ~~NAV~~LNAV/CNAV data from which the URA is read, for the worst-case location within the satellite footprint.

IS :
Note #1: URA applies over the transmission interval that is applicable to the LNAV/CNAV data from which the URA is read, for the worst-case location within the satellite footprint.

IS200-159 :

Section Number :
6.2.1.0-3

WAS :
Note #2: The URA for a particular signal may be represented by a single index in the NAV data or by a composite of more than one index representing components of the total URA. Specific URA indexes and formulae for calculating the total URA for each signal are defined in appendix 20 for the LNAV message and appendix 30 for the CNAV message.

Redlines :
Note #2: The URA for a particular signal may be represented by a single index in the ~~NAV~~LNAV data ~~or~~and by a composite of more than one index representing components of the total URA in the CNAV data. Specific URA indexes and formulae for calculating the total URA for each signal are defined in ~~appendix~~Appendix ~~20~~II for the LNAV message and ~~appendix~~Appendix ~~30~~III for the CNAV message.

IS :
Note #2: The URA for a particular signal may be represented by a single index in the LNAV data and by a composite of more than one index representing components of the total URA in the CNAV data. Specific URA indexes and formulae for calculating the total URA for each signal are defined in Appendix II for the LNAV message and Appendix III for the CNAV message.

IS200-191 :

Section Number :
6.2.4.0-1

WAS :
The GPS week numbering system is established with week number zero (0) being defined as that week which started with the X1 epoch occurring at midnight UTC (USNO) on the night of January 5, 1980/ morning of January 6, 1980. The GPS week number continuously increments by one (1) at each end/start of week epoch without ever resetting to zero. Users must recognize that the week number information contained in the Nav Message may not necessarily reflect the current full GPS week number (see paragraphs 20.3.3.3.1.1, 20.3.3.5.1.5, 20.3.3.5.2.4, and 30.3.3.1.1.1).

Redlines :
The GPS week numbering system is established with week number zero (0) being defined as that week which started with the X1 epoch occurring at midnight UTC (USNO) on the night of January 5, 1980/ morning of January 6, 1980. The GPS week number continuously increments by one (1) at each end/start of week epoch without ever resetting to zero. Users must recognize that the week number information contained in the ~~Nav~~LNAV/CNAV ~~Message~~message may not necessarily reflect the current full GPS week number (see paragraphs 20.3.3.3.1.1, 20.3.3.5.1.5, 20.3.3.5.2.4, and 30.3.3.1.1.1).

IS :
The GPS week numbering system is established with week number zero (0) being defined as that week which started with the X1 epoch occurring at midnight UTC (USNO) on the night of January 5, 1980/ morning of January 6, 1980. The GPS week number continuously increments by one (1) at each end/start of week epoch without ever resetting to zero. Users must recognize that the week number information contained in the LNAV/CNAV message may not necessarily reflect the current full GPS week number (see paragraphs 20.3.3.3.1.1, 20.3.3.5.1.5, 20.3.3.5.2.4, and 30.3.3.1.1.1).

IS200-1282 :

Section Number :
6.3.6.2.1.0-4

WAS :

Table 6-1 Additional C/A-/P-Code Phase Assignments (sheet 1 of 5)

PRN Signal No.	C/A			P		
	G2 Delay (Chips)	Initial G2 Setting (Octal)*	First 10 Chips (Octal)**	X2 Delay (Chips)	P-code Relative Advance (Hours) **	First 12 Chips (Octal)
64	729	0254	1523	27	P_{27}(t+24)	5112
65	695	1602	0175	28	P_{28}(t+24)	0667
66	780	1160	0617	29	P_{29}(t+24)	6111
67	801	1114	0663	30	P_{30}(t+24)	5266
68	788	1342	0435	31	P_{31}(t+24)	4711
69	732	0025	1752	32	P_{32}(t+24)	0166
70	34	1523	0254	33	P_{33}(t+24)	6251
71	320	1046	0731	34	P_{34}(t+24)	5306
72	327	0404	1373	35	P_{35}(t+24)	0761
73	389	1445	0332	36	P_{36}(t+24)	6152
74	407	1054	0723	37	P_{37}(t+24)	1247
75	525	0072	1705	1	P_{1}(t+48)	1736
76	405	0262	1515	2	P_{2}(t+48)	2575
77	221	0077	1700	3	P_{3}(t+48)	3054
78	761	0521	1256	4	P_{4}(t+48)	3604
79	260	1400	0377	5	P_{5}(t+48)	7520
80	326	1010	0767	6	P_{6}(t+48)	5472
81	955	1441	0336	7	P_{7}(t+48)	0417
82	653	0365	1412	8	P_{8}(t+48)	2025
83	699	0270	1507	9	P_{9}(t+48)	7230
84	422	0263	1514	10	P_{10}(t+48)	5736
85	188	0613	1164	11	P_{11}(t+48)	0575
86	438	0277	1500	12	P_{12}(t+48)	2054
87	959	1562	0215	13	P_{13}(t+48)	3204
88	539	1674	0103	14	P_{14}(t+48)	7720
89	879	1113	0664	15	P_{15}(t+48)	5572
90	677	1245	0532	16	P_{16}(t+48)	4457
91	586	0606	1171	17	P_{17}(t+48)	0005
92	153	0136	1641	18	P_{18}(t+48)	2220
93	792	0256	1521	19	P_{19}(t+48)	3332
94	814	1550	0227	20	P_{20}(t+48)	3777
95	446	1234	0543	21	P_{21}(t+48)	3555

* 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. 64 are: 1101010011).

** P_i(t+N): P-code sequence of PRN number i shifted by N hours. See Section 6.3.6.2.1.

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

Redlines :

Table 6-1 Additional C/A-/P-Code Phase Assignments (sheet 1 of 5)

PRN Signal No.	C/A			P		
	G2 Delay (Chips)	Initial G2 Setting (Octal)*	First 10 Chips (Octal)**	X2 Delay (Chips)	P-code Relative Advance (Hours) **	First 12 Chips (Octal)
64	729	0254	1523	27	P_{27}(t+24)	5112
65	695	1602	0175	28	P_{28}(t+24)	0667
66	780	1160	0617	29	P_{29}(t+24)	6111
67	801	1114	0663	30	P_{30}(t+24)	5266
68	788	1342	0435	31	P_{31}(t+24)	4711
69	732	0025	1752	32	P_{32}(t+24)	0166
70	34	1523	0254	33	P_{33}(t+24)	6251
71	320	1046	0731	34	P_{34}(t+24)	5306
72	327	0404	1373	35	P_{35}(t+24)	0761
73	389	1445	0332	36	P_{36}(t+24)	6152
74	407	1054	0723	37	P_{37}(t+24)	1247
75	525	0072	1705	1	P_{1}(t+48)	1736
76	405	0262	1515	2	P_{2}(t+48)	2575
77	221	0077	1700	3	P_{3}(t+48)	3054
78	761	0521	1256	4	P_{4}(t+48)	3604
79	260	1400	0377	5	P_{5}(t+48)	7520
80	326	1010	0767	6	P_{6}(t+48)	5472
81	955	1441	0336	7	P_{7}(t+48)	0417
82	653	0365	1412	8	P_{8}(t+48)	2025
83	699	0270	1507	9	P_{9}(t+48)	7230
84	422	0263	1514	10	P_{10}(t+48)	5736
85	188	0613	1164	11	P_{11}(t+48)	0575
86	438	0277	1500	12	P_{12}(t+48)	2054
87	959	1562	0215	13	P_{13}(t+48)	3204
88	539	1674	0103	14	P_{14}(t+48)	7720
89	879	1113	0664	15	P_{15}(t+48)	5572
90	677	1245	0532	16	P_{16}(t+48)	4457
91	586	0606	1171	17	P_{17}(t+48)	0005
92	153	0136	1641	18	P_{18}(t+48)	2220
93	792	0256	1521	19	P_{19}(t+48)	3332
94	814	1550	0227	20	P_{20}(t+48)	3777
95	446	1234	0543	21	P_{21}(t+48)	3555

* In the octal notation for the first 10 chips of the C/A-code or the initial G2 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. 64 are: 1101010011).

** P_i(t+N): P-code sequence of PRN number i shifted by N hours. See Section 6.3.6.2.1.

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

Table 6-1 Additional C/A-/P-Code Phase Assignments (sheet 1 of 5)

PRN Signal No.	C/A			P		
	G2 Delay (Chips)	Initial G2 Setting (Octal)*	First 10 Chips (Octal)*	X2 Delay (Chips)	P-code Relative Advance (Hours) **	First 12 Chips (Octal)
64	729	0254	1523	27	$P_{27}(t+24)$	5112
65	695	1602	0175	28	$P_{28}(t+24)$	0667
66	780	1160	0617	29	$P_{29}(t+24)$	6111
67	801	1114	0663	30	$P_{30}(t+24)$	5266
68	788	1342	0435	31	$P_{31}(t+24)$	4711
69	732	0025	1752	32	$P_{32}(t+24)$	0166
70	34	1523	0254	33	$P_{33}(t+24)$	6251
71	320	1046	0731	34	$P_{34}(t+24)$	5306
72	327	0404	1373	35	$P_{35}(t+24)$	0761
73	389	1445	0332	36	$P_{36}(t+24)$	6152
74	407	1054	0723	37	$P_{37}(t+24)$	1247
75	525	0072	1705	1	$P_{1}(t+48)$	1736
76	405	0262	1515	2	$P_{2}(t+48)$	2575
77	221	0077	1700	3	$P_{3}(t+48)$	3054
78	761	0521	1256	4	$P_{4}(t+48)$	3604
79	260	1400	0377	5	$P_{5}(t+48)$	7520
80	326	1010	0767	6	$P_{6}(t+48)$	5472
81	955	1441	0336	7	$P_{7}(t+48)$	0417
82	653	0365	1412	8	$P_{8}(t+48)$	2025
83	699	0270	1507	9	$P_{9}(t+48)$	7230
84	422	0263	1514	10	$P_{10}(t+48)$	5736
85	188	0613	1164	11	$P_{11}(t+48)$	0575
86	438	0277	1500	12	$P_{12}(t+48)$	2054
87	959	1562	0215	13	$P_{13}(t+48)$	3204
88	539	1674	0103	14	$P_{14}(t+48)$	7720
89	879	1113	0664	15	$P_{15}(t+48)$	5572
90	677	1245	0532	16	$P_{16}(t+48)$	4457
91	586	0606	1171	17	$P_{17}(t+48)$	0005
92	153	0136	1641	18	$P_{18}(t+48)$	2220
93	792	0256	1521	19	$P_{19}(t+48)$	3332
94	814	1550	0227	20	$P_{20}(t+48)$	3777
95	446	1234	0543	21	$P_{21}(t+48)$	3555

* In the octal notation for the first 10 chips of the C/A-code or the initial G2 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. 64 are: 1101010011).

** $P_i(t+N)$: P-code sequence of PRN number i shifted by N hours. See Section 6.3.6.2.1.

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

IS200-237 :

Section Number :
6.3.7.0-1

WAS :
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.

Redlines :
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~~LNAV 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.

IS :
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 LNAV 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.

IS200-270 :

Section Number :
20.2.1.0-1

WAS :
In addition to the documents listed in paragraph 2.1, the following documents of the issue specified contribute to the definition of the NAV data related interfaces and form a part of this Appendix to the extent specified herein.

Redlines :
In addition to the documents listed in paragraph 2.1, the following documents of the issue specified contribute to the definition of the ~~NAV~~LNAV data related interfaces and form a part of this Appendix to the extent specified herein.

IS :
In addition to the documents listed in paragraph 2.1, the following documents of the issue specified contribute to the definition of the LNAV data related interfaces and form a part of this Appendix to the extent specified herein.

IS200-273 :

Section Number :
20.2.2.0-1

WAS :
In addition to the documents listed in paragraph 2.2, the following documents of the issue specified contribute to the definition of the NAV data related interfaces and form a part of this Appendix to the extent specified herein.

Redlines :
In addition to the documents listed in paragraph 2.2, the following documents of the issue specified contribute to the definition of the ~~NAV~~LNAV data related interfaces and form a part of this Appendix to the extent specified herein.

IS :
In addition to the documents listed in paragraph 2.2, the following documents of the issue specified contribute to the definition of the LNAV data related interfaces and form a part of this Appendix to the extent specified herein.

IS200-281 :

Section Number :
20.3.2.0-3

WAS :
Block II and IIA SVs are designed with sufficient memory capacity for storing at least 60 days of uploaded NAV data. However, the memory retention of these SVs will determine the duration of data transmission. Block IIR SVs have the capability, with current memory margin, to store at least 60 days of uploaded NAV data in the Block IIA mode and to store at least 60 days of CS data needed to generate NAV data on-board in the Autonav mode. GPS III SVs have the capability to support operation for at least 60 days without contact from the CS. Alternating ones and zeros will be transmitted in words 3 through 10 in place of the normal NAV data whenever the SV cannot locate the requisite valid control or data element in its on-board computer memory. The following specifics apply to this default action: (a) the parity of the affected words will be invalid, (b) the two trailing bits of word 10 will be zeros (to allow the parity of subsequent subframes to be valid -- reference paragraph 20.3.5), (c) if the problem is the lack of a data element, only the directly related subframe(s) will be treated in this manner, (d) if a control element cannot be located, this default action will be applied to all subframes and all subframes will indicate ID = 1 (Block II/IIA only) (i.e., an ID-code of 001) in the HOW (reference paragraph 20.3.3.2) (Block IIR/IIR-M, IIF, and GPS III SVs indicate the proper subframe ID for all subframes). Certain failures of control elements which may occur in the SV memory or during an upload will cause the SV to transmit in non-standard codes (NSC and NSY) which would preclude normal use by the US. Normal NAV data transmission will be resumed by the SV whenever a valid set of elements becomes available.

Redlines :
Block II and IIA SVs are designed with sufficient memory capacity for storing at least 60 days of uploaded ~~NAV~~LNAV data. However, the memory retention of these SVs will determine the duration of data transmission. Block IIR SVs have the capability, with current memory margin, to store at least 60 days of uploaded ~~NAV~~LNAV data in the Block IIA mode and to store at least 60 days of CS data needed to generate ~~NAV~~LNAV data on-board in the Autonav mode. GPS III SVs have the capability to support operation for at least 60 days without contact from the CS. Alternating ones and zeros will be transmitted in words 3 through 10 in place of the normal ~~NAV~~LNAV data whenever the SV cannot locate the requisite valid control or data element in its on-board computer memory. The following specifics apply to this default action: (a) the parity of the affected words will be invalid, (b) the two trailing bits of word 10 will be zeros (to allow the parity of subsequent subframes to be valid -- reference paragraph 20.3.5), (c) if the problem is the lack of a data element, only the directly related subframe(s) will be treated in this manner, (d) if a control element cannot be located, this default action will be applied to all subframes and all subframes will indicate ID = 1 (Block II/IIA only) (i.e., an ID-code of 001) in the HOW (reference paragraph 20.3.3.2) (Block IIR/IIR-M, IIF, and GPS III SVs indicate the proper subframe ID for all subframes). Certain failures of control elements which may occur in the SV memory or during an upload will cause the SV to transmit in non-standard codes (NSC and NSY) which would preclude normal use by the US. Normal ~~NAV~~LNAV data transmission will be resumed by the SV whenever a valid set of elements becomes available.

IS :
Block II and IIA SVs are designed with sufficient memory capacity for storing at least 60 days of uploaded LNAV data. However, the memory retention of these SVs will determine the duration of data transmission. Block IIR SVs have the capability, with current memory margin, to store at least 60 days of uploaded LNAV data in the Block IIA mode and to store at least 60 days of CS data needed to generate LNAV data on-board in the Autonav mode. GPS III SVs have the capability to support operation for at least 60 days without contact from the CS. Alternating ones and zeros will be transmitted in words 3 through 10 in place of the normal LNAV data whenever the SV cannot locate the requisite valid control or data element in its on-board computer memory. The following specifics apply to this default action: (a) the parity of the affected words will be invalid, (b) the two trailing bits of word 10 will be zeros (to allow the parity of subsequent subframes to be valid -- reference paragraph 20.3.5), (c) if the problem is the lack of a data element, only the directly related subframe(s) will be treated in this manner, (d) if a control element cannot be located, this default

action will be applied to all subframes and all subframes will indicate ID = 1 (Block II/IIA only) (i.e., an ID-code of 001) in the HOW (reference paragraph 20.3.3.2) (Block IIR/IIR-M, IIF, and GPS III SVs indicate the proper subframe ID for all subframes). Certain failures of control elements which may occur in the SV memory or during an upload will cause the SV to transmit in non-standard codes (NSC and NSY) which would preclude normal use by the US. Normal LNAV data transmission will be resumed by the SV whenever a valid set of elements becomes available.

IS200-282 :

Section Number :
20.3.2.0-4

WAS :
Block II/IIA SVs are uploaded with a minimum of 60 days of NAV data. However, the EAROM retentivity for Block II SVs is designed and guaranteed for only 14 days. Therefore, Block II SV memory is most likely to fail sometime during long-term extended operations after repeated write operations. In the case of memory failure, the SV will transmit alternating ones and zeros in word 3-10 as specified in the above paragraph. The EAROM retentivity for Block IIA SVs is designed and guaranteed for at least 60 days.

Redlines :
Block II/IIA SVs are uploaded with a minimum of 60 days of ~~NAV~~LNAV data. However, the EAROM retentivity for Block II SVs is designed and guaranteed for only 14 days. Therefore, Block II SV memory is most likely to fail sometime during long-term extended operations after repeated write operations. In the case of memory failure, the SV will transmit alternating ones and zeros in word 3-10 as specified in the above paragraph. The EAROM retentivity for Block IIA SVs is designed and guaranteed for at least 60 days.

IS :
Block II/IIA SVs are uploaded with a minimum of 60 days of LNAV data. However, the EAROM retentivity for Block II SVs is designed and guaranteed for only 14 days. Therefore, Block II SV memory is most likely to fail sometime during long-term extended operations after repeated write operations. In the case of memory failure, the SV will transmit alternating ones and zeros in word 3-10 as specified in the above paragraph. The EAROM retentivity for Block IIA SVs is designed and guaranteed for at least 60 days.

IS200-284 :

Section Number :
20.3.2.0-6

WAS :
Although the data content of the SVs will be temporarily reduced during the upload process, the transmission of valid NAV data will be continuous. The data capacity of specific operational SVs may be reduced to accommodate partial memory failures.

Redlines :
Although the data content of the SVs will be temporarily reduced during the upload process, the transmission of valid ~~NAV~~LNAV data will be continuous. The data capacity of specific operational SVs may be reduced to accommodate partial memory failures.

IS :
Although the data content of the SVs will be temporarily reduced during the upload process, the transmission of valid LNAV data will be continuous. The data capacity of specific operational SVs may be reduced to accommodate partial memory failures.

IS200-320 :

Section Number :
20.3.3.3.1.3.0-3

WAS :
For each URA index (N), users may compute a nominal URA value (X) as given by:

• If the value of N is 6 or less, X = $2^{(1 + N/2)}$,

• If the value of N is 6 or more, but less than 15, X = $2^{(N - 2)}$,

• N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk.

For N = 1, 3, and 5, X should be rounded to 2.8, 5.7, and 11.3 meters, respectively.

For Block IIR/IIR-M SVs in the Autonav mode, the URA shall be defined to mean “no better than X meters”, with “X” as defined above for each URA index.

The nominal URA value (X) is suitable for use as a conservative prediction of the RMS signal-in-space (SIS) range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement de-weighting, receiver autonomous integrity monitoring (RAIM), figure of merit (FOM) computations). Integrity properties of the URA are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the URA index (see 20.3.3.1).

URA accounts for SIS contributions to user range error which include, but are not limited to, the following: LSB representation/truncation error; the net effect of clock correction polynomial error and code phase error in the transmitted signal for single-frequency L1C/A or single-frequency L2C users who correct the code phase as described in Section 30.3.3.3.1.1.1; the net effect of clock parameter, code phase, and inter-signal correction error for dual-frequency L1/L2 and L1/L5 users who correct for group delay and ionospheric effects as described in Section 30.3.3.3.1.1.2; ephemeris error; anisotropic antenna errors; and signal deformation error. URA does not account for user range error contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.

Redlines :

For each URA index (N), users may compute a nominal URA value (X) as given by:

- If the value of N is 6 or less, $X = 2^{(1 + N/2)}$,

- If the value of N is 6 or more, but less than 15, $X = 2^{(N - 2)}$,

- N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk.

For N = 1, 3, and 5, X should be rounded to 2.8, 5.7, and 11.3 meters, respectively.

For Block IIR/IIR-M SVs in the Autonav mode, the URA shall be defined to mean “no better than X meters”, with “X” as defined above for each URA index.

The nominal URA value (X) is suitable for use as a conservative prediction of the RMS signal-in-space (SIS) range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement de-weighting, receiver autonomous integrity monitoring (RAIM), figure of merit (FOM) computations). Integrity properties of the URA are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the URA index (see 20.3.3.1).

URA accounts for SIS contributions to user range error which include, but are not limited to, the following: LNAV LSB representation/truncation error; the net effect of LNAV clock correction polynomial error and code phase error in the transmitted signal for single-frequency L1C/A~~ or single-frequency L2C users who correct the code phase as described in Section 30.3.3.3.1.1.1; the net effect of clock parameter~~,~~ code phase~~L1P(Y),~~ and inter-signal correction error~~L2P(Y), ~~for~~or dual-frequency~~ L1/L2 and~~ ~~L1/L5~~P(Y) users who correct~~ for group delay and~~the ~~ionospheric~~code ~~effects~~phase as described in Section ~~30~~20.3.3.3~~.1.1~~.~~2~~3; LNAV ephemeris error; anisotropic antenna errors; and signal deformation error. URA does not account for user range error contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.

IS :
For each URA index (N), users may compute a nominal URA value (X) as given by:

- If the value of N is 6 or less, $X = 2^{(1 + N/2)}$,

- If the value of N is 6 or more, but less than 15, $X = 2^{(N - 2)}$,

- N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk.

For N = 1, 3, and 5, X should be rounded to 2.8, 5.7, and 11.3 meters, respectively.

For Block IIR/IIR-M SVs in the Autonav mode, the URA shall be defined to mean “no better than X meters”, with “X” as defined above for each URA index.

The nominal URA value (X) is suitable for use as a conservative prediction of the RMS signal-in-space (SIS) range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement de-weighting, receiver autonomous integrity monitoring (RAIM), figure of merit (FOM) computations). Integrity properties of the URA are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the URA index (see 20.3.3.1).

URA accounts for SIS contributions to user range error which include, but are not limited to, the following: LNAV LSB representation/truncation error; the net effect of LNAV clock correction polynomial error and code phase error in the transmitted signal for single-frequency L1C/A, L1P(Y), L2P(Y), or dual-frequency P(Y) users who correct the code phase as described in Section 20.3.3.3.3; LNAV ephemeris error; anisotropic antenna errors; and signal deformation error. URA does not account for user range error contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.

IS200-322 :

Section Number :
20.3.3.3.1.4.0-1

WAS :
The six-bit health indication given by bits 17 through 22 of word three refers to the transmitting SV. The MSB shall indicate a summary of the health of the NAV data, where

0 = all NAV data are OK,

1 = some or all NAV data are bad.

Redlines :
The six-bit health indication given by bits 17 through 22 of word three refers to the transmitting SV. The MSB shall indicate a summary of the health of the ~~NAV~~LNAV data, where

0 = all ~~NAV~~LNAV data are OK,

1 = some or all ~~NAV~~LNAV data are bad.

IS :
The six-bit health indication given by bits 17 through 22 of word three refers to the transmitting SV. The MSB shall indicate a summary of the health of the LNAV data, where

0 = all LNAV data are OK,

1 = some or all LNAV data are bad.

IS200-329 :

Section Number :
20.3.3.3.1.6.0-1

WAS :
When bit 1 of word four is a "1", it shall indicate that the NAV data stream was commanded OFF on the P-code of the in-phase component of the L2 channel.

This bit provides no indication of whether NAV data is or is not present on any code modulated on the quadrature component of the L2 channel.

Redlines :
When bit 1 of word four is a "1", it shall indicate that the ~~NAV~~LNAV data stream was commanded OFF on the P-code of the in-phase component of the L2 channel.

This bit provides no indication of whether ~~NAV~~LNAV data is or is not present on any code modulated on the quadrature component of the L2 channel.

IS :
When bit 1 of word four is a "1", it shall indicate that the LNAV data stream was commanded OFF on the P-code of the in-phase component of the L2 channel.

This bit provides no indication of whether LNAV data is or is not present on any code modulated on the quadrature component of the L2 channel.

IS200-337 :

Section Number :
20.3.3.3.3.0-1

WAS :
The algorithms defined below (a) allow all users to correct the code phase time received from the SV with respect to both SV code phase offset and relativistic effects, (b) permit the "single frequency" (L1 or L2) user to compensate for the effects of SV group delay differential (the user who utilizes both frequencies does not require this correction, since the clock parameters account for the induced effects), and (c) allow the "two frequency" (L1 and L2) user to correct for the group propagation delay due to ionospheric effects (the single frequency user may correct for ionospheric effects as described in paragraph 20.3.3.5.2.5).

Redlines :
The algorithms defined below (a) allow all users to correct the code phase time received from the SV with respect to both SV code phase offset and relativistic effects, (b) permit the "single-frequency" (L1 or L2) user to compensate for the effects of SV group delay differential (the user who utilizes both frequencies does not require this correction, since the clock parameters account for the induced effects), and (c) allow the "~~two~~ dual-frequency" (L1 and L2) user to correct for the group propagation delay due to ionospheric effects (the single-frequency user may correct for ionospheric effects as described in paragraph 20.3.3.5.2.5).

IS :
The algorithms defined below (a) allow all users to correct the code phase time received from the SV with respect to both SV code phase offset and relativistic effects, (b) permit the "single-frequency" (L1 or L2) user to compensate for the effects of SV group delay differential (the user who utilizes both frequencies does not require this correction, since the clock parameters account for the induced effects), and (c) allow the "dual-frequency" (L1 and L2) user to correct for the group propagation delay due to ionospheric effects (the single-frequency user may correct for ionospheric effects as described in paragraph 20.3.3.5.2.5).

IS200-340 :

Section Number :
20.3.3.3.3.1.0-1

WAS :
The polynomial defined in the following allows the user to determine the effective SV PRN code phase offset referenced to the phase center of the antennas (Δt_{sv}) with respect to GPS system time (t) at the time of data transmission. The coefficients transmitted in subframe 1 describe the offset apparent to the two-frequency user for the interval of time in which the parameters are transmitted. This estimated correction accounts for the deterministic SV clock error characteristics of bias, drift and aging, as well as for the SV implementation characteristics of group delay bias and mean differential group delay. Since these coefficients do not include corrections for relativistic effects, the user's equipment must determine the requisite relativistic correction. Accordingly, the offset given below includes a term to perform this function.

Redlines :
The polynomial defined in the following allows the user to determine the effective SV PRN code phase offset referenced to the phase center of the antennas (Δt_{sv}) with respect to GPS system time (t) at the time of data transmission. The coefficients transmitted in subframe 1 describe the offset apparent to the ~~two~~dual-frequency user for the interval of time in which the parameters are transmitted. This estimated correction accounts for the deterministic SV clock error characteristics of bias, drift and aging, as well as for the SV implementation characteristics of group delay bias and mean differential group delay. Since these coefficients do not include corrections for relativistic effects, the user's equipment must determine the requisite relativistic correction. Accordingly, the offset given below includes a term to perform this function.

IS :
The polynomial defined in the following allows the user to determine the effective SV PRN code phase offset referenced to the phase center of the antennas (Δt_{sv}) with respect to GPS system time (t) at the time of data transmission. The coefficients transmitted in subframe 1 describe the offset apparent to the dual-frequency user for the interval of time in which the parameters are transmitted. This estimated correction accounts for the deterministic SV clock error characteristics of bias, drift and aging, as well as for the SV implementation characteristics of group delay bias and mean differential group delay. Since these coefficients do not include corrections for relativistic effects, the user's equipment must determine the requisite relativistic correction. Accordingly, the offset given below includes a term to perform this function.

IS200-341 :

Section Number :
20.3.3.3.3.1.0-2

WAS :
The user shall correct the time received from the SV with the equation (in seconds)

$$t = t_{sv} - \Delta t_{sv} \quad (1)$$

where

t = GPS system time (seconds),

t_{sv} = effective SV PRN code phase time at message transmission time (seconds),

Δt_{sv} = SV PRN code phase time offset (seconds).

The SV PRN code phase offset is given by

$$\Delta t_{sv} = a_{f0} + a_{f1}(t - t_{oc}) + a_{f2}(t - t_{oc})^2 + \Delta t_r \qquad (2)$$

where

a_{f0}, a_{f1} and a_{f2} are the polynomial coefficients given in subframe 1, t_{oc} is the clock data reference time in seconds (reference paragraph 20.3.4.5), and Δt_r is the relativistic correction term (seconds) which is given by

$$\Delta t_r = F e \sqrt{A} \sin E_k.$$

The orbit parameters (e, $\sqrt{A}$, E_k) used here are described in discussions of data contained in subframes 2 and 3, while F is a constant whose value is

$$F = \frac{-2\sqrt{\mu}}{c^2} = -4.442807633 (10)^{-10} \frac{\text{sec}}{\sqrt{\text{meter}}},$$

where

$\mu = 3.986005 \times 10^{14} \frac{\text{meters}^3}{\text{second}^2}$ = value of Earth's universal gravitational parameters

$c = 2.99792458 \times 10^8 \frac{\text{meters}}{\text{second}}$ = speed of light.

Note that equations (1) and (2), as written, are coupled. While the coefficients a_{f0}, a_{f1} and a_{f2} are generated by using GPS time as indicated in equation (2), sensitivity of t_{sv} to t is negligible. This negligible sensitivity will allow the user to approximate t by t_{SV} in equation (2). The value of t must account for beginning or end of week crossovers. That is, if the quantity $t - t_{oc}$ is greater than 302,400 seconds, subtract 604,800 seconds from t. If the quantity $t - t_{oc}$ is less than -302,400 seconds, add 604,800 seconds to t.

The Control Segment will utilize the following alternative but equivalent expression for the relativistic effect when estimating the NAV parameters:

$$\Delta t_r = -\frac{2\,\vec{R} \bullet \vec{V}}{c^2}$$

where

$\vec{R}$ is the instantaneous position vector of the SV,

$\vec{V}$ is the instantaneous velocity vector of the SV, and

c is the speed of light. (Reference paragraph 20.3.4.3).

It is immaterial whether the vectors $\vec{R}$ and $\vec{V}$ are expressed in earth-fixed, rotating coordinates or in earth-centered, inertial coordinates.

Redlines :
The user shall correct the time received from the SV with the equation (in seconds)

$t = t_{sv} - \Delta t_{sv}$ (1)

where

t = GPS system time (seconds),

t_{sv} = effective SV PRN code phase time at message transmission time (seconds),

Δt_{sv} = SV PRN code phase time offset (seconds).

The SV PRN code phase offset is given by

$\Delta t_{sv} = a_{f0} + a_{f1}(t - t_{oc}) + a_{f2}(t - t_{oc})^2 + \Delta t_r$ (2)

where

a_{f0}, a_{f1} and a_{f2} are the polynomial coefficients given in subframe 1, t_{oc} is the clock data reference time in seconds (reference paragraph 20.3.4.5), and Δt_r is the relativistic correction term (seconds) which is given by

$$\Delta t_r = F e \sqrt{A} \sin E_k.$$

The orbit parameters (e, $\sqrt{A}$, E_k) used here are described in discussions of data contained in subframes 2 and 3, while F is a constant whose value is

$$F = \frac{-2\sqrt{\mu}}{c^2} = -4.442807633 (10)^{-10} \frac{\text{sec}}{\sqrt{\text{meter}}},$$

where

$\mu = 3.986005 \times 10^{14} \frac{\text{meters}^3}{\text{second}^2}$ = value of Earth's universal gravitational parameters

$c = 2.99792458 \times 10^8 \frac{\text{meters}}{\text{second}}$ = speed of light.

Note that equations (1) and (2), as written, are coupled. While the coefficients a_{f0}, a_{f1} and a_{f2} are generated by using GPS time as indicated in equation (2), sensitivity of t_{sv} to t is negligible. This negligible sensitivity will allow the user to approximate t by t_{SV} in equation (2). The value of t must account for beginning or end of week crossovers. That is, if the quantity $t - t_{oc}$ is greater than 302,400 seconds, subtract 604,800 seconds from t. If the quantity $t - t_{oc}$ is less than -302,400 seconds, add 604,800 seconds to t.

The Control Segment will utilize the following alternative but equivalent expression for the relativistic effect when estimating the ~~NAV~~LNAV/CNAV parameters:

$$\Delta t_r = -\frac{2\, \vec{R} \bullet \vec{V}}{c^2}$$

where

$\vec{R}$ is the instantaneous position vector of the SV,

$\vec{V}$ is the instantaneous velocity vector of the SV, and

c is the speed of light. (Reference paragraph 20.3.4.3).

It is immaterial whether the vectors $\vec{R}$ and $\vec{V}$ are expressed in earth-fixed, rotating coordinates or in earth-centered, inertial coordinates.

IS :
The user shall correct the time received from the SV with the equation (in seconds)

$$t = t_{sv} - \Delta t_{sv} \quad (1)$$

where

t	=	GPS system time (seconds),
t_{sv}	=	effective SV PRN code phase time at message transmission time (seconds),
Δt_{sv}	=	SV PRN code phase time offset (seconds).

The SV PRN code phase offset is given by

$$\Delta t_{sv} = a_{f0} + a_{f1}(t - t_{oc}) + a_{f2}(t - t_{oc})^2 + \Delta t_r \quad (2)$$

where

a_{f0}, a_{f1} and a_{f2} are the polynomial coefficients given in subframe 1, t_{oc} is the clock data reference time in seconds (reference paragraph 20.3.4.5), and Δt_r is the relativistic correction term (seconds) which is given by

$$\Delta t_r = F e \sqrt{A} \sin E_k.$$

The orbit parameters (e, $\sqrt{A}$, E_k) used here are described in discussions of data contained in subframes 2 and 3, while F is a constant whose value is

$$F = \frac{-2\sqrt{\mu}}{c^2} = -4.442807633 (10)^{-10} \frac{\text{sec}}{\sqrt{\text{meter}}},$$

where

$$\mu = 3.986005 \times 10^{14} \frac{\text{meters}^3}{\text{second}^2} = \quad \text{value of Earth's universal gravitational parameters}$$

$$c = 2.99792458 \times 10^{8} \frac{\text{meters}}{\text{second}} = \quad \text{speed of light.}$$

Note that equations (1) and (2), as written, are coupled. While the coefficients a_{f0}, a_{f1} and a_{f2} are generated by using GPS time as indicated in equation (2), sensitivity of t_{sv} to t is negligible. This negligible sensitivity will allow the user to approximate t by t_{SV} in equation (2). The value of t must account for beginning or end of week crossovers. That is, if the quantity t - t_{oc} is greater than 302,400 seconds, subtract 604,800 seconds from t. If the quantity t - t_{oc} is less than -302,400 seconds, add 604,800 seconds to t.

The Control Segment will utilize the following alternative but equivalent expression for the relativistic effect when estimating the LNAV/CNAV parameters:

$$\Delta t_r = -\frac{2 \vec{R} \bullet \vec{V}}{c^2}$$

where

$\vec{R}$ is the instantaneous position vector of the SV,

$\vec{V}$ is the instantaneous velocity vector of the SV, and

c is the speed of light. (Reference paragraph 20.3.4.3).

It is immaterial whether the vectors $\vec{R}$ and $\vec{V}$ are expressed in earth-fixed, rotating coordinates or in earth-centered, inertial coordinates.

IS200-342 :

Section Number :
20.3.3.3.3.2

WAS :
L1 - L2 Correction.

Redlines :
L1 -or L2 Correction.

IS :
L1 or L2 Correction.

IS200-343 :

Section Number :
20.3.3.3.3.2.0-1

WAS :
The L1 and L2 correction term, T_{GD}, is initially calculated by the CS to account for the effect of SV group delay differential between L1 P(Y) and L2 P(Y) based on measurements made by the SV contractor during SV manufacture. The value of T_{GD} for each SV may be subsequently updated to reflect the actual on-orbit group delay differential. This correction term is only for the benefit of "single-frequency" (L1 P(Y) or L2 P(Y)) users; it is necessitated by the fact that the SV clock offset estimates reflected in the a_{f0} clock correction coefficient (see paragraph 20.3.3.3.3.1) are based on the effective PRN code phase as apparent with two frequency (L1 P(Y) and L2 P(Y)) ionospheric corrections. Thus, the user who utilizes the L1 P(Y) signal only shall modify the code phase offset in accordance with paragraph 20.3.3.3.3.1 with the equation

$$(\Delta t_{SV})_{L1P(Y)} = \Delta t_{SV} - T_{GD}$$

where T_{GD} is provided to the user as subframe 1 data. For the user who utilizes L2 P(Y) only, the code phase modification is given by

$$(\Delta t_{SV})_{L2P(Y)} = \Delta t_{SV} - \gamma T_{GD}$$

where, denoting the nominal center frequencies of L1 and L2 as f_{L1} and f_{L2} respectively,

$$\gamma = (f_{L1}/f_{L2})^2 = (1575.42/1227.6)^2 = (77/60)^2.$$

Redlines :

The L1 and L2 correction term, T_{GD}, is initially calculated by the CS to account for the effect of SV group delay differential between L1 P(Y) and L2 P(Y) based on measurements made by the SV contractor during SV manufacture. The value of T_{GD} for each SV may be subsequently updated to reflect the actual on-orbit group delay differential. This correction term is only for the benefit of "single-frequency" (L1 C/A, L1 P(Y) or L2 P(Y)) users; it is necessitated by the fact that the SV clock offset estimates reflected in the a_{f0} clock correction coefficient (see paragraph 20.3.3.3.3.1) are based on the effective PRN code phase as apparent with two dual-frequency (L1 P(Y) and L2 P(Y)) ionospheric corrections. Thus, the user who utilizes the L1 C/A P(Y) signal only shall modify the code phase offset in accordance with paragraph 20.3.3.3.3.1 with the equation

$$(\Delta t_{SV})_{L1\ C/A\ P(Y)} = \Delta t_{SV} - T_{GD}$$

where T_{GD} is provided to the user as subframe 1 data. For the user who utilizes L1 P(Y) only, the code phase modification is given by

$$(\Delta t_{SV})_{L1\ P(Y)} = \Delta t_{SV} - T_{GD}$$

For the user who utilizes L2 P(Y) only, the code phase modification is given by

$$(\Delta t_{SV})_{L2\ P(Y)} = \Delta t_{SV} - \gamma T_{GD}$$

where, denoting the nominal center frequencies of L1 and L2 as f_{L1} and f_{L2} respectively,

$$\gamma = (f_{L1}/f_{L2})^2 = (1575.42/1227.6)^2 = (77/60)^2.$$

IS :

The L1 and L2 correction term, T_{GD}, is initially calculated by the CS to account for the effect of SV group delay differential between L1 P(Y) and L2 P(Y) based on measurements made by the SV contractor during SV manufacture. The value of T_{GD} for each SV may be subsequently updated to reflect the actual on-orbit group delay differential. This correction term is only for the benefit of "single-frequency" (L1 C/A, L1 P(Y) or L2 P(Y)) users; it is necessitated by the fact that the SV clock offset estimates reflected in the a_{f0} clock correction coefficient (see paragraph 20.3.3.3.3.1) are based on the effective PRN code phase as apparent with dual-frequency (L1 P(Y) and L2 P(Y)) ionospheric corrections. Thus, the user who utilizes the L1 C/A signal only shall modify the code phase offset in accordance with paragraph 20.3.3.3.3.1 with the equation

$$(\Delta t_{SV})_{L1C/A} = \Delta t_{SV} - T_{GD}$$

where T_{GD} is provided to the user as subframe 1 data. For the user who utilizes L1 P(Y) only, the code phase modification is given by

$$(\Delta t_{SV})_{L1\,P(Y)} = \Delta t_{SV} - T_{GD}$$

For the user who utilizes L2 P(Y) only, the code phase modification is given by

$$(\Delta t_{SV})_{L2\,P(Y)} = \Delta t_{SV} - \gamma T_{GD}$$

where, denoting the nominal center frequencies of L1 and L2 as f_{L1} and f_{L2} respectively,

$$\gamma = (f_{L1}/f_{L2})^2 = (1575.42/1227.6)^2 = (77/60)^2.$$

IS200-346 :

Section Number :
20.3.3.3.3.3.0-1

WAS :
The two frequency (L1 P(Y) and L2 P(Y)) user shall correct for the group delay due to ionospheric effects by applying the relationship:

$$PR = \frac{PR_{L2P(Y)} - \gamma PR_{L1P(Y)}}{1 - \gamma}$$

where

PR	=	pseudorange corrected for ionospheric effects,
PR_i	=	pseudorange measured on the channel indicated by the subscript,

and γ is as defined in paragraph 20.3.3.3.3.2. The clock correction coefficients are based on "two frequency" measurements and therefore account for the effects of mean differential delay in SV instrumentation.

Redlines :
The dual-frequency (L1 P(Y) and L2 P(Y)) user shall correct for the group delay due to ionospheric effects by applying the relationship:

$$PR = \frac{PR_{L2P(Y)} - \gamma PR_{L1P(Y)}}{1 - \gamma}$$

where

PR	=	pseudorange corrected for ionospheric effects,
PR_i	=	pseudorange measured on the channel indicated by the subscript,

and γ is as defined in paragraph 20.3.3.3.3.2. The clock correction coefficients are based on "~~two~~ dual-frequency" measurements and therefore account for the effects of mean differential delay in SV instrumentation.

IS :
The dual-frequency (L1 P(Y) and L2 P(Y)) user shall correct for the group delay due to ionospheric effects by applying the relationship:

$$PR = \frac{PR_{L2P(Y)} - \gamma PR_{L1P(Y)}}{1 - \gamma}$$

where

PR	=	pseudorange corrected for ionospheric effects,
PR_i	=	pseudorange measured on the channel indicated by the subscript,

and γ is as defined in paragraph 20.3.3.3.3.2. The clock correction coefficients are based on "dual-frequency" measurements and therefore account for the effects of mean differential delay in SV instrumentation.

IS200-379 :

Section Number :
20.3.3.4.4.0-1

WAS :
Users desiring to take advantage of the NMCT data provided in page 13 of subframe 4 shall first examine the AODO term currently provided in subframe 2 of the NAV data from the transmitting SV. If the AODO term is 27900 seconds (i.e., binary 11111), then the NMCT currently available from the transmitting SV is invalid and shall not be used. If the AODO term is less than 27900 seconds, then the user shall compute the validity time for that NMCT (t_{nmct}) using the ephemeris t_{oe} parameter and the AODO term from the current subframe 2 as follows:

$$OFFSET = t_{oe} \text{ [modulo 7200]}$$

$$\text{if } OFFSET = 0, \text{ then } t_{nmct} = t_{oe} - AODO$$

$$\text{if } OFFSET > 0, \text{ then } t_{nmct} = t_{oe} - OFFSET + 7200 - AODO$$

Note that the foregoing computation of t_{nmct} must account for any beginning or end of week crossovers; for example,

$$\text{if } t^* - t_{nmct} > 302{,}400 \text{ then } t_{nmct} = t_{nmct} + 604{,}800$$

$$\text{if } t^* - t_{nmct} < -302{,}400 \text{ then } t_{nmct} = t_{nmct} - 604{,}800$$

* t is GPS system time at time of transmission.

Users are advised that different SVs will transmit NMCTs with different t_{nmct} and that the best performance will generally be obtained by applying data from the NMCT with the latest (largest) t_{nmct}. As a result, users should compute and examine the t_{nmct} values for all visible and available SVs in order to find and use the NMCT with the latest t_{nmct}. If the same latest (largest) t_{nmct} is provided by two or more visible and available SVs, then the NMCT from any SV with the latest t_{nmct} may be selected and used; however, the estimated range deviation (ERD) value provided by the selected NMCT for the other SVs with the same t_{nmct} shall be set to zero if those SVs are used in the positioning solution. It should be noted that the intended positioning solution accuracy improvement will not be obtained if the data from two different NMCTs are applied simultaneously or if the data from a given NMCT is applied to just a subset of the SVs used in the positioning solution (i.e., mixed mode operation results in potentially degraded solution accuracy).

Redlines :
Users desiring to take advantage of the NMCT data provided in page 13 of subframe 4 shall first examine the AODO term currently provided in subframe 2 of the ~~NAV~~LNAV data from the transmitting SV. If the AODO term is 27900 seconds (i.e., binary 11111), then the NMCT currently available from the transmitting SV is invalid and shall not be used. If the AODO term is 27900 seconds (i.e., binary 11111), then the NMCT currently available from the transmitting SV is invalid and shall not be used. If the AODO term is less than 27900 seconds, then the user shall compute the validity time for that NMCT (t_{nmct}) using the ephemeris t_{oe} parameter and the AODO term from the current subframe 2 as follows:

OFFSET = t_{oe} [modulo 7200]

if OFFSET = 0, then t_{nmct} = t_{oe} - AODO

if OFFSET > 0, then t_{nmct} = t_{oe} - OFFSET + 7200 - AODO

Note that the foregoing computation of t_{nmct} must account for any beginning or end of week crossovers; for example,

if t* - t_{nmct} > 302,400 then t_{nmct} = t_{nmct} + 604,800

if t* - t_{nmct} < -302,400 then t_{nmct} = t_{nmct} - 604,800

* t is GPS system time at time of transmission.

Users are advised that different SVs will transmit NMCTs with different t_{nmct} and that the best performance will generally be obtained by applying data from the NMCT with the latest (largest) t_{nmct}. As a result, users should compute and examine the t_{nmct} values for all visible and available SVs in order to find and use the NMCT with the latest t_{nmct}. If the same latest (largest) t_{nmct} is provided by two or more visible and available SVs, then the NMCT from any SV with the latest t_{nmct} may be selected and used; however, the estimated range deviation (ERD) value provided by the selected NMCT for the other SVs with the same t_{nmct} shall be set to zero if those SVs are used in the positioning solution. It should be noted that the intended positioning solution accuracy improvement will not be obtained if the data from two different NMCTs are applied simultaneously or if the data from a given NMCT is applied to just a subset of the SVs used in the positioning solution (i.e., mixed mode operation results in potentially degraded solution accuracy).

IS :

Users desiring to take advantage of the NMCT data provided in page 13 of subframe 4 shall first examine the AODO term currently provided in subframe 2 of the LNAV data from the transmitting SV. If the AODO term is 27900 seconds (i.e., binary 11111), then the NMCT currently available from the transmitting SV is invalid and shall not be used. If the AODO term is less than 27900 seconds, then the user shall compute the validity time for that NMCT (t_{nmct}) using the ephemeris t_{oe} parameter and the AODO term from the current subframe 2 as follows:

OFFSET = t_{oe} [modulo 7200]

if OFFSET = 0, then t_{nmct} = t_{oe} - AODO

if OFFSET > 0, then t_{nmct} = t_{oe} - OFFSET + 7200 - AODO

Note that the foregoing computation of t_{nmct} must account for any beginning or end of week crossovers; for example, if $t^* - t_{nmct} > 302,400$ then $t_{nmct} = t_{nmct} + 604,800$

if $t^* - t_{nmct} < -302,400$ then $t_{nmct} = t_{nmct} - 604,800$

* t is GPS system time at time of transmission.

Users are advised that different SVs will transmit NMCTs with different t_{nmct} and that the best performance will generally be obtained by applying data from the NMCT with the latest (largest) t_{nmct}. As a result, users should compute and examine the t_{nmct} values for all visible and available SVs in order to find and use the NMCT with the latest t_{nmct}. If the same latest (largest) t_{nmct} is provided by two or more visible and available SVs, then the NMCT from any SV with the latest t_{nmct} may be selected and used; however, the estimated range deviation (ERD) value provided by the selected NMCT for the other SVs with the same t_{nmct} shall be set to zero if those SVs are used in the positioning solution. It should be noted that the intended positioning solution accuracy improvement will not be obtained if the data from two different NMCTs are applied simultaneously or if the data from a given NMCT is applied to just a subset of the SVs used in the positioning solution (i.e., mixed mode operation results in potentially degraded solution accuracy).

IS200-387 :

Section Number :
20.3.3.5.1.1.0-1

WAS :
The two MSBs of word three in each page shall contain data ID. Data ID number two (denoted by binary code 01) denotes the NAV data structure of D(t) which is described in this Appendix and is the only valid value.

Redlines :
The two MSBs of word three in each page shall contain data ID. Data ID number two (denoted by binary code 01) denotes the ~~NAV~~LNAV data structure of D(t) which is described in this Appendix and is the only valid value.

IS :
The two MSBs of word three in each page shall contain data ID. Data ID number two (denoted by binary code 01) denotes the LNAV data structure of D(t) which is described in this Appendix and is the only valid value.

IS200-400 :

Section Number :
20.3.3.5.1.3.0-2

WAS :
The three MSBs of the eight-bit health words indicate health of the NAV data in accordance with the code given in Table 20-VII. The six-bit words provide a one-bit summary of the NAV data's health status in the MSB position in accordance with paragraph 20.3.3.3.1.4. The five LSBs of both the eight-bit and the six-bit words provide the health status of the SV's signal components in accordance with the code given in Table 20-VIII. A special meaning is assigned, however, to the "6 ones" combination of the six-bit health words in the 25th page of subframes 4 and 5: it indicates that "the SV which has that ID is not available and there may be no data regarding that SV in that page of subframes 4 and 5 that is assigned to normally contain the almanac data of that SV" (NOTE: this special meaning applies to the 25th page of subframes 4 and 5 only). The health indication shall be given relative to the "as designed" capabilities of each SV (as designated by the configuration code -- see paragraph 20.3.3.5.1.4). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or it has been configured into a mode which is normal from a user standpoint and does not require that capability.

Redlines :
The three MSBs of the eight-bit health words indicate health of the ~~NAV~~LNAV data in accordance with the code given in Table 20-VII. The six-bit words provide a one-bit summary of the ~~NAV~~LNAV data's health status in the MSB position in accordance with paragraph 20.3.3.3.1.4. The five LSBs of both the eight-bit and the six-bit words provide the health status of the SV's signal components in accordance with the code given in Table 20-VIII. A special meaning is assigned, however, to the "6 ones" combination of the six-bit health words in the 25th page of subframes 4 and 5: it indicates that "the SV which has that ID is not available and there may be no data regarding that SV in that page of subframes 4 and 5 that is assigned to normally contain the almanac data of that SV" (NOTE: this special meaning applies to the 25th page of subframes 4 and 5 only). The health indication shall be given relative to the "as designed" capabilities of each SV (as designated by the configuration code -- see paragraph 20.3.3.5.1.4). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or it has been configured into a mode which is normal from a user standpoint and does not require that capability.

IS :
The three MSBs of the eight-bit health words indicate health of the LNAV data in accordance with the code given in Table 20-VII. The six-bit words provide a one-bit summary of the LNAV data's health status in the MSB position in accordance with paragraph 20.3.3.3.1.4. The five LSBs of both the eight-bit and the six-bit words provide the health status of the SV's signal components in accordance with the code given in Table 20-VIII. A special meaning is assigned, however, to the "6 ones" combination of the six-bit health words in the 25th page of subframes 4 and 5: it indicates that "the SV which has that ID is not available and there may be no data regarding that SV in that page of subframes 4 and 5 that is assigned to normally contain the almanac data of that SV" (NOTE: this special meaning applies to the 25th page of subframes 4 and 5 only). The health indication shall be given relative to the "as designed" capabilities of each SV (as designated by the configuration code -- see paragraph 20.3.3.5.1.4). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or it has been configured into a mode which is normal from a user standpoint and does not require that capability.

IS200-1581 :

Section Number :
20.3.3.5.1.3.0-6

WAS :
Table 20-VII. NAV Data Health Indications

Redlines :
Table 20-VII. ~~NAV~~LNAV Data Health Indications

IS :
Table 20-VII. LNAV Data Health Indications

IS200-428 :

Section Number :
20.3.3.5.2.0-1

WAS :
The following algorithms shall apply when interpreting Almanac, Coordinated Universal Time, Ionospheric Model, and NMCT data in the NAV message.

Redlines :
The following algorithms shall apply when interpreting Almanac, Coordinated Universal Time, Ionospheric Model, and NMCT data in the ~~NAV~~LNAV message.

IS :
The following algorithms shall apply when interpreting Almanac, Coordinated Universal Time, Ionospheric Model, and NMCT data in the LNAV message.

IS200-441 :

Section Number :
20.3.3.5.2.4.0-1

WAS :
Page 18 of subframe 4 includes: (1) the parameters needed to relate GPS time to UTC, and (2) notice to the user regarding the scheduled future or recent past (relative to NAV message upload) value of the delta time due to leap seconds (Δt_{LSF}), together with the week number (WN_{LSF}) and the day number (DN) at the end of which the leap second becomes effective. "Day one" is the first day relative to the end/start of week and the WN_{LSF} value consists of eight bits which shall be a modulo 256 binary representation of the GPS week number (see paragraph 6.2.4) to which the DN is referenced. The user must account for the truncated nature of this parameter as well as truncation of WN, WN_t, and WN_{LSF} due to rollover of full week number (see paragraph 3.3.4(b)). The CS shall manage these parameters such that, when Δt_{LS} and Δt_{LSF} differ, the absolute value of the difference between the untruncated WN and WN_{LSF} values shall not exceed 127.

Redlines :
Page 18 of subframe 4 includes: (1) the parameters needed to relate GPS time to UTC, and (2) notice to the user regarding the scheduled future or recent past (relative to ~~NAV~~LNAV message upload) value of the delta time due to leap seconds (Δt_{LSF}), together with the week number (WN_{LSF}) and the day number (DN) at the end of which the leap second becomes effective. "Day one" is the first day relative to the end/start of week and the WN_{LSF} value consists of eight bits which shall be a modulo 256 binary representation of the GPS week number (see paragraph 6.2.4) to which the DN is referenced. The user must account for the truncated nature of this parameter as well as truncation of WN, WN_t, and WN_{LSF} due to rollover of full week number (see paragraph 3.3.4(b)). The CS shall manage these parameters such that, when Δt_{LS} and Δt_{LSF} differ, the absolute value of the difference between the untruncated WN and WN_{LSF} values shall not exceed 127.

IS :
Page 18 of subframe 4 includes: (1) the parameters needed to relate GPS time to UTC, and (2) notice to the user regarding the scheduled future or recent past (relative to LNAV message upload) value of the delta time due to leap seconds (Δt_{LSF}), together with the week number (WN_{LSF}) and the day number (DN) at the end of which the leap second becomes effective. "Day one" is the first day relative to the end/start of week and the WN_{LSF} value consists of eight bits which shall be a modulo 256 binary representation of the GPS week number (see paragraph 6.2.4) to which the DN is referenced. The user must account for the truncated nature of this parameter as well as truncation of WN, WN_t, and WN_{LSF} due to rollover of full week number (see paragraph 3.3.4(b)). The CS shall manage these parameters such that, when Δt_{LS} and Δt_{LSF} differ, the absolute value of the difference between the untruncated WN and WN_{LSF} values shall not exceed 127.

IS200-447 :

Section Number :
20.3.3.5.2.5.0-1

WAS :
The "two frequency" (L1 and L2) user shall correct the time received from the SV for ionospheric effect by utilizing the time delay differential between L1 and L2 (reference paragraph 20.3.3.3.3.3). The "one frequency" user, however, may use the model given in Figure 20-4 to make this correction. It is estimated that the use of this model will provide at least a 50 percent reduction in the single - frequency user's RMS error due to ionospheric propagation effects. During extended operations, or for the SVs in the Autonav mode if the CS is unable to upload the SVs, the use of this model will yield unpredictable results.

Redlines :
The "~~two~~ dual-frequency" (L1 and L2) user shall correct the time received from the SV for ionospheric effect by utilizing the time delay differential between L1 and L2 (reference paragraph 20.3.3.3.3.3). The "~~one~~ single-frequency" user, however, may use the model given in Figure 20-4 to make this correction. It is estimated that the use of this model will provide at least a 50 percent reduction in the single - frequency user's RMS error due to ionospheric propagation effects. During extended operations, or for the SVs in the Autonav mode if the CS is unable to upload the SVs, the use of this model will yield unpredictable results.

IS :
The "dual-frequency" (L1 and L2) user shall correct the time received from the SV for ionospheric effect by utilizing the time delay differential between L1 and L2 (reference paragraph 20.3.3.3.3.3). The "single-frequency" user, however, may use the model given in Figure 20-4 to make this correction. It is estimated that the use of this model will provide at least a 50 percent reduction in the single - frequency user's RMS error due to ionospheric propagation effects. During extended operations, or for the SVs in the Autonav mode if the CS is unable to upload the SVs, the use of this model will yield unpredictable results.

IS200-458 :

Section Number :
20.3.4.2.0-1

WAS :
In controlling the SVs and uploading of data, the CS shall allow for the following timing relationships:

a. Each SV operates on its own SV time;

b. All time-related data in the TLM word and the HOW shall be in SV-time;

c. All other data in the NAV message shall be relative to GPS time;

d. The acts of transmitting the NAV message shall be executed by the SV on SV time.

Redlines :
In controlling the SVs and uploading of data, the CS shall allow for the following timing relationships:

a. Each SV operates on its own SV time;

b. All time-related data in the TLM word and the HOW shall be in SV-time;

c. All other data in the ~~NAV~~LNAV message shall be relative to GPS time;

d. The acts of transmitting the ~~NAV~~LNAV message shall be executed by the SV on SV time.

IS :
In controlling the SVs and uploading of data, the CS shall allow for the following timing relationships:

a. Each SV operates on its own SV time;

b. All time-related data in the TLM word and the HOW shall be in SV-time;

c. All other data in the LNAV message shall be relative to GPS time;

d. The acts of transmitting the LNAV message shall be executed by the SV on SV time.

IS200-464 :

Section Number :
20.3.4.4.0-3

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 nominally remains valid for the duration of its curve fit interval. A CEI data set may be rendered invalid before the end of its curve fit interval when it is superseded by the SV cutting over to new data.

Redlines :
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 nominally remains valid for the duration of its curve fit interval. A CEI data set may be rendered ~~invalid~~obsolete before the end of its curve fit interval when it is superseded by the SV cutting over to new data.

IS :
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 nominally remains valid for the duration of its curve fit interval. A CEI data set may be rendered obsolete before the end of its curve fit interval when it is superseded by the SV cutting over to new data.

IS200-510 :

Section Number :
30.3.1.0-1

WAS :
The CNAV data, $D_C(t)$, is a higher precision representation and nominally contains more accurate data than the NAV data, D(t), described in Appendix II. Also, the CNAV data stream uses a different parity algorithm.

Redlines :
The CNAV data, $D_C(t)$, is a higher precision representation and nominally contains more accurate data than the ~~NAV~~LNAV data, D(t), described in Appendix II. Also, the CNAV data stream uses a different parity algorithm.

IS :
The CNAV data, $D_C(t)$, is a higher precision representation and nominally contains more accurate data than the LNAV data, D(t), described in Appendix II. Also, the CNAV data stream uses a different parity algorithm.

IS200-511 :

Section Number :
30.3.1.0-2

WAS :
Users are advised that the CNAV data, $D_C(t)$, described in this appendix and the NAV data, D(t), described in Appendix II, should not be mixed in any user algorithms or applications. Each of the two data sets should be treated as a set and used accordingly.

Redlines :
Users are advised that the CNAV data, $D_C(t)$, described in this appendix and the ~~NAV~~LNAV data, D(t), described in Appendix II, should not be mixed in any user algorithms or applications. Each of the two data sets should be treated as a set and used accordingly.

IS :
Users are advised that the CNAV data, $D_C(t)$, described in this appendix and the LNAV data, D(t), described in Appendix II, should not be mixed in any user algorithms or applications. Each of the two data sets should be treated as a set and used accordingly.

IS200-546 :

Section Number :
30.3.3.1.1.4.0-2

WAS :
The URA_{ED} index is a signed, two's complement integer in the range of +15 to -16 and has the following relationship to the ED URA:

URA_{ED} Index	URA_{ED} (meters)			
15	6144.00	< URA_{ED}		(or no accuracy prediction is available)
14	3072.00	< URA_{ED}	≤	6144.00
13	1536.00	< URA_{ED}	≤	3072.00
12	768.00	< URA_{ED}	≤	1536.00
11	384.00	< URA_{ED}	≤	768.00
10	192.00	< URA_{ED}	≤	384.00
9	96.00	< URA_{ED}	≤	192.00
8	48.00	< URA_{ED}	≤	96.00
7	24.00	< URA_{ED}	≤	48.00
6	13.65	< URA_{ED}	≤	24.00
5	9.65	< URA_{ED}	≤	13.65
4	6.85	< URA_{ED}	≤	9.65
3	4.85	< URA_{ED}	≤	6.85
2	3.40	< URA_{ED}	≤	4.85
1	2.40	< URA_{ED}	≤	3.40
0	1.70	< URA_{ED}	≤	2.40
-1	1.20	< URA_{ED}	≤	1.70
-2	0.85	< URA_{ED}	≤	1.20
-3	0.60	< URA_{ED}	≤	0.85
-4	0.43	< URA_{ED}	≤	0.60
-5	0.30	< URA_{ED}	≤	0.43
-6	0.21	< URA_{ED}	≤	0.30
-7	0.15	< URA_{ED}	≤	0.21
-8	0.11	< URA_{ED}	≤	0.15

-9	0.08	$< URA_{ED} \leq$	0.11
-10	0.06	$< URA_{ED} \leq$	0.08
-11	0.04	$< URA_{ED} \leq$	0.06
-12	0.03	$< URA_{ED} \leq$	0.04
-13	0.02	$< URA_{ED} \leq$	0.03
-14	0.01	$< URA_{ED} \leq$	0.02
-15		$URA_{ED} \leq$	0.01
-16	No accuracy prediction available-use at own risk		

For each URA_{ED} index (N), users may compute a nominal URA_{ED} value (X) as given by:

- If the value of N is 6 or less, but more than -16, $X = 2^{(1 + N/2)}$,
- If the value of N is 6 or more, but less than 15, $X = 2^{(N - 2)}$,
- N = -16 or N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk.

For N = 1, 3, and 5, X should be rounded to 2.8, 5.7, and 11.3 meters, respectively.

The nominal URA_{ED} value (X) is suitable for use as a conservative prediction of the RMS ED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement deweighting, RAIM, FOM computations). Integrity properties of the $IAURA_{ED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the broadcast URA_{ED} index (see 30.3.3.1.1).

For the nominal URA_{ED} value and the $IAURA_{ED}$ value, users may compute an adjusted URA_{ED} value as a function of SV elevation angle (E), for E ≥ 0, as follows:

$$\text{Adjusted Nominal } URA_{ED} = \text{Nominal } URA_{ED} \left(\sin(E+90 \text{ degrees})\right)$$

$$\text{Adjusted } IAURA_{ED} = IAURA_{ED} \left(\sin(E+90 \text{ degrees})\right)$$

URA_{ED} and $IAURA_{ED}$ account for SIS contributions to user range error which include, but are not limited to, the following: LSB representation/truncation error, alongtrack ephemeris errors, and crosstrack ephemeris errors. URA_{ED} and $IAURA_{ED}$ do not account for user range error contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.

Redlines :

The URA_{ED} index is a signed, two's complement integer in the range of +15 to -16 and has the following relationship to the ED URA:

URA_{ED} Index	URA_{ED} (meters)				
15	6144.00	< URA_{ED}		(or no accuracy prediction is available)	
14	3072.00	< URA_{ED}	≤	6144.00	
13	1536.00	< URA_{ED}	≤	3072.00	
12	768.00	< URA_{ED}	≤	1536.00	
11	384.00	< URA_{ED}	≤	768.00	
10	192.00	< URA_{ED}	≤	384.00	
9	96.00	< URA_{ED}	≤	192.00	
8	48.00	< URA_{ED}	≤	96.00	
7	24.00	< URA_{ED}	≤	48.00	
6	13.65	< URA_{ED}	≤	24.00	
5	9.65	< URA_{ED}	≤	13.65	
4	6.85	< URA_{ED}	≤	9.65	
3	4.85	< URA_{ED}	≤	6.85	
2	3.40	< URA_{ED}	≤	4.85	
1	2.40	< URA_{ED}	≤	3.40	
0	1.70	< URA_{ED}	≤	2.40	
-1	1.20	< URA_{ED}	≤	1.70	
-2	0.85	< URA_{ED}	≤	1.20	
-3	0.60	< URA_{ED}	≤	0.85	
-4	0.43	< URA_{ED}	≤	0.60	
-5	0.30	< URA_{ED}	≤	0.43	
-6	0.21	< URA_{ED}	≤	0.30	
-7	0.15	< URA_{ED}	≤	0.21	
-8	0.11	< URA_{ED}	≤	0.15	
-9	0.08	< URA_{ED}	≤	0.11	
-10	0.06	< URA_{ED}	≤	0.08	
-11	0.04	< URA_{ED}	≤	0.06	
-12	0.03	< URA_{ED}	≤	0.04	

-13	0.02	< URA_{ED}	≤	0.03
-14	0.01	< URA_{ED}	≤	0.02
-15		URA_{ED}	≤	0.01
-16	No accuracy prediction available-use at own risk			

For each URA_{ED} index (N), users may compute a nominal URA_{ED} value (X) as given by:

- If the value of N is 6 or less, but more than -16, $X = 2^{(1 + N/2)}$,
- If the value of N is 6 or more, but less than 15, $X = 2^{(N - 2)}$,
- N = -16 or N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk.

For N = 1, 3, and 5, X should be rounded to 2.8, 5.7, and 11.3 meters, respectively.

The nominal URA_{ED} value (X) is suitable for use as a conservative prediction of the RMS ED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement deweighting, RAIM, FOM computations). Integrity properties of the $IAURA_{ED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the broadcast URA_{ED} index (see 30.3.3.1.1).

For the nominal URA_{ED} value and the $IAURA_{ED}$ value, users may compute an adjusted URA_{ED} value as a function of SV elevation angle (E), for E ≥ 0, as follows:

$$\text{Adjusted Nominal } URA_{ED} = \text{Nominal } URA_{ED} (\sin(E+90 \text{ degrees}))$$

$$\text{Adjusted } IAURA_{ED} = IAURA_{ED} (\sin(E+90 \text{ degrees}))$$

URAED and IAURAED account for SIS contributions to user range error which include, but are not limited to, the following: CNAV LSB representation/truncation error, alongtrack CNAV ephemeris errors, and crosstrack CNAV ephemeris errors. URA_{ED} and $IAURA_{ED}$ do not account for user range error contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.

IS :
The URA_{ED} index is a signed, two's complement integer in the range of +15 to -16 and has the following relationship to the ED URA:

URA_{ED} Index	URA_{ED} (meters)			
15	6144.00	< URA_{ED}		(or no accuracy prediction is available)
14	3072.00	< URA_{ED}	≤	6144.00

13	1536.00	< URA_{ED} ≤	3072.00
12	768.00	< URA_{ED} ≤	1536.00
11	384.00	< URA_{ED} ≤	768.00
10	192.00	< URA_{ED} ≤	384.00
9	96.00	< URA_{ED} ≤	192.00
8	48.00	< URA_{ED} ≤	96.00
7	24.00	< URA_{ED} ≤	48.00
6	13.65	< URA_{ED} ≤	24.00
5	9.65	< URA_{ED} ≤	13.65
4	6.85	< URA_{ED} ≤	9.65
3	4.85	< URA_{ED} ≤	6.85
2	3.40	< URA_{ED} ≤	4.85
1	2.40	< URA_{ED} ≤	3.40
0	1.70	< URA_{ED} ≤	2.40
-1	1.20	< URA_{ED} ≤	1.70
-2	0.85	< URA_{ED} ≤	1.20
-3	0.60	< URA_{ED} ≤	0.85
-4	0.43	< URA_{ED} ≤	0.60
-5	0.30	< URA_{ED} ≤	0.43
-6	0.21	< URA_{ED} ≤	0.30
-7	0.15	< URA_{ED} ≤	0.21
-8	0.11	< URA_{ED} ≤	0.15
-9	0.08	< URA_{ED} ≤	0.11
-10	0.06	< URA_{ED} ≤	0.08
-11	0.04	< URA_{ED} ≤	0.06
-12	0.03	< URA_{ED} ≤	0.04
-13	0.02	< URA_{ED} ≤	0.03
-14	0.01	< URA_{ED} ≤	0.02
-15		URA_{ED} ≤	0.01
-16	No accuracy prediction available-use at own risk		

For each URA_{ED} index (N), users may compute a nominal URA_{ED} value (X) as given by:

• If the value of N is 6 or less, but more than -16, $X = 2^{(1 + N/2)}$,

• If the value of N is 6 or more, but less than 15, $X = 2^{(N - 2)}$,

• N = -16 or N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk.

For N = 1, 3, and 5, X should be rounded to 2.8, 5.7, and 11.3 meters, respectively.

The nominal URA_{ED} value (X) is suitable for use as a conservative prediction of the RMS ED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement deweighting, RAIM, FOM computations). Integrity properties of the $IAURA_{ED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the broadcast URA_{ED} index (see 30.3.3.1.1).

For the nominal URA_{ED} value and the $IAURA_{ED}$ value, users may compute an adjusted URA_{ED} value as a function of SV elevation angle (E), for E ≥ 0, as follows:

$$\text{Adjusted Nominal } URA_{ED} = \text{Nominal } URA_{ED} \, (\sin(E+90 \text{ degrees}))$$

$$\text{Adjusted } IAURA_{ED} = IAURA_{ED} \, (\sin(E+90 \text{ degrees}))$$

URA_{ED} and $IAURA_{ED}$ account for SIS contributions to user range error which include, but are not limited to, the following: CNAV LSB representation/truncation error, alongtrack CNAV ephemeris errors, and crosstrack CNAV ephemeris errors. URA_{ED} and $IAURA_{ED}$ do not account for user range error contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.

IS200-552 :

Section Number :
30.3.3.1.3.0-4

WAS :

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

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
WN	Data Sequence Propagation Week Number	13	1		weeks
URA_{ED} Index	ED Accuracy Index	5*			(see text)
Signal health (L1/L2/L5)		3	1		(see text)
t_{op}	CEI Data sequence propagation 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-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.

Redlines :

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

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
WN	Data Sequence Propagation Week Number	13	1		weeks
URA_{ED} Index	ED Accuracy Index	5*			(see text)
Signal health (L1/L2/L5)		3	1		(see text)
t_{op}	CEI Data sequence propagation 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-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.

[parameter alignment fixed]

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

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
WN	Data Sequence Propagation Week Number	13	1		weeks
URA_{ED} Index	ED Accuracy Index	5*			(see text)
Signal health (L1/L2/L5)		3	1		(see text)
t_{op}	CEI Data sequence propagation 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-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.

IS200-576 :

Section Number :
30.3.3.2.4.0-6

WAS :
For each URA_{NED0} index (N), users may compute a nominal URA_{NED0} value (X) as given by:

- If the value of N is 6 or less, but more than -16, $X = 2^{(1 + N/2)}$,
- If the value of N is 6 or more, but less than 15, $X = 2^{(N - 2)}$,
- N = -16 or N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk.

For N = 1, 3, and 5, X should be rounded to 2.8, 5.7, and 11.3 meters, respectively.

The nominal URA_{NED0} value (X) shall be suitable for use as a conservative prediction of the RMS NED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement de-weighting RAIM, FOM computations). Integrity properties of the $IAURA_{NED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the URA_{NED0} index, URA_{NED1} index, and URA_{NED2} index (see 30.3.3.1.1).

URA_{NED0} accounts for zeroth order SIS-contributions to user range error which include, but are not limited to, the following: LSB representation/truncation error; the net effect of clock correction polynomial error and code phase error in the transmitted signal for single-frequency L1C/A or single-frequency L2C users who correct the code phase as described in Section 30.3.3.3.1.1.1; the net effect of clock parameter, code phase, and inter-signal correction error for dual-frequency L1/L2 and L1/L5 users who correct for group delay and ionospheric effects as described in Section 30.3.3.3.1.1.2; radial ephemeris error; anisotropic antenna errors; and signal deformation error. URA_{NED0} does not account for user range contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.

The transmitted URA_{NED1} index is an integer value in the range 0 to 7. The URA_{NED1} index has the following relationship to the URA_{NED1} value:

$$URA_{NED1} = \frac{1}{2^N} \text{ (meters/second)}$$

where

N = 14 + URA_{NED1} Index

The transmitted URA_{NED2} index is an integer value in the range 0 to 7. URA_{NED2} index has the following relationship to the URA_{NED2}:

$$URA_{NED2} = \frac{1}{2^N} \text{ (meters/second}^2\text{)}$$

where

N = 28 + URA_{NED2} Index.

Redlines :

For each URA_{NED0} index (N), users may compute a nominal URA_{NED0} value (X) as given by:

- If the value of N is 6 or less, but more than -16, $X = 2^{(1 + N/2)}$,
- If the value of N is 6 or more, but less than 15, $X = 2^{(N - 2)}$,
- N = -16 or N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk.

For N = 1, 3, and 5, X should be rounded to 2.8, 5.7, and 11.3 meters, respectively.

The nominal URA_{NED0} value (X) shall be suitable for use as a conservative prediction of the RMS NED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement de-weighting RAIM, FOM computations). Integrity properties of the $IAURA_{NED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the URA_{NED0} index, URA_{NED1} index, and URA_{NED2} index (see 30.3.3.1.1).

URA_{NED0} accounts for zeroth order SIS contributions to user range error which include, but are not limited to, the following: CNAV LSB representation/truncation error; the net effect of CNAV clock correction polynomial error and code phase error in the transmitted signal for single-frequency ~~L1C/A or single frequency~~ L2C users who correct the code phase as described in Section 30.3.3.3.1.1.1; the net effect of clock parameter, code phase, and inter-signal correction error for dual-frequency L1 C/A and ~~/~~L2C ~~and L1/L5~~ users who correct for group delay and ionospheric effects as described in Section 30.3.3.3.1.1.2; radial ephemeris error; anisotropic antenna errors; and signal deformation error. URA_{NED0} does not account for user range contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.

The transmitted URA_{NED1} index is an integer value in the range 0 to 7. The URA_{NED1} index has the following relationship to the URA_{NED1} value:

$$URA_{NED1} = \frac{1}{2^N} \text{ (meters/second)}$$

where

$N = 14 + URA_{NED1}$ Index

The transmitted URA_{NED2} index is an integer value in the range 0 to 7. URA_{NED2} index has the following relationship to the URA_{NED2}:

$$URA_{NED2} = \frac{1}{2^N} \text{ (meters/second}^2\text{)}$$

where

$N = 28 + URA_{NED2}$ Index.

IS :

For each URA_{NED0} index (N), users may compute a nominal URA_{NED0} value (X) as given by:

- If the value of N is 6 or less, but more than -16, $X = 2^{(1 + N/2)}$,
- If the value of N is 6 or more, but less than 15, $X = 2^{(N - 2)}$,
- N = -16 or N = 15 shall indicate the absence of an accuracy prediction and shall advise the standard positioning service user to use that SV at his own risk.

For N = 1, 3, and 5, X should be rounded to 2.8, 5.7, and 11.3 meters, respectively.

The nominal URA_{NED0} value (X) shall be suitable for use as a conservative prediction of the RMS NED range errors for accuracy-related purposes in the pseudorange domain (e.g., measurement de-weighting RAIM, FOM computations). Integrity properties of the $IAURA_{NED}$ are specified with respect to the scaled (multiplied by either 4.42 or 5.73 as appropriate) upper bound values of the URA_{NED0} index, URA_{NED1} index, and URA_{NED2} index (see 30.3.3.1.1).

URA_{NED0} accounts for zeroth order SIS-contributions to user range error which include, but are not limited to, the following: CNAV LSB representation/truncation error; the net effect of CNAV clock correction polynomial error and code phase error in the transmitted signal for single-frequency L2C users who correct the code phase as described in Section 30.3.3.3.1.1.1; the net effect of clock parameter, code phase, and inter-signal correction error for dual-frequency L1 C/A and L2C users who correct for group delay and ionospheric effects as described in Section 30.3.3.3.1.1.2; radial ephemeris error; anisotropic antenna errors; and signal deformation error. URA_{NED0} does not account for user range contributions due to the inaccuracy of the broadcast ionospheric data parameters used in the single-frequency ionospheric model or for other atmospheric effects.

The transmitted URA_{NED1} index is an integer value in the range 0 to 7. The URA_{NED1} index has the following relationship to the URA_{NED1} value:

$$URA_{NED1} = \frac{1}{2^N} \text{ (meters/second)}$$

where

N = 14 + URA_{NED1} Index

The transmitted URA_{NED2} index is an integer value in the range 0 to 7. URA_{NED2} index has the following relationship to the URA_{NED2}:

$$URA_{NED2} = \frac{1}{2^N} \text{ (meters/second}^2\text{)}$$

where

N = 28 + URA_{NED2} Index.

IS200-584

Section Number :
30.3.3.3.1.1.1.0-1

WAS :
The correction terms, T_{GD}, $ISC_{L1C/A}$ and ISC_{L2C}, are initially provided by the CS to account for the effect of inter-signal biases between L1 P(Y) and L2 P(Y), L1 P(Y) and L1 C/A, and between L1 P(Y) and L2C, respectively, based on measurements made by the SV contractor during SV manufacture. The values of T_{GD} and ISCs for each SV may be subsequently updated to reflect the actual on-orbit group delay differential. For maximum accuracy, the single frequency L1 C/A user must use the correction terms to make further modifications to the code phase offset in paragraph 20.3.3.3.3.1 with the equation:

$$(\Delta t_{SV})_{L1C/A} = \Delta t_{SV} - T_{GD} + ISC_{L1C/A}$$

where T_{GD} (see paragraph 20.3.3.3.3.2) and $ISC_{L1C/A}$ are provided to the user as Message Type 30 data, described in paragraph 30.3.3.3.1.1. For the single frequency L2C user, the code phase offset modification is given by:

$$(\Delta t_{SV})_{L2C} = \Delta t_{SV} - T_{GD} + ISC_{L2C}$$

where, ISC_{L2C} is provided to the user as Message Type 30 data.

The values of $ISC_{L1C/A}$ and ISC_{L2C} are measured values that represent the mean SV group delay differential between the L1 P(Y)-code and the L1 C/A- or L2C-codes respectively as follows,

$$ISC_{L1C/A} = t_{L1P(Y)} - t_{L1C/A}$$

$$ISC_{L2C} = t_{L1P(Y)} - t_{L2C}$$

where, t_{Lix} is the GPS time the i^{th} frequency x signal (a specific epoch of the signal) is transmitted from the SV antenna phase center.

Redlines :
The correction terms, T_{GD}, $ISC_{L1C/A}$ and ISC_{L2C}, are initially provided by the CS to account for the effect of inter-signal biases between L1 P(Y) and L2 P(Y), L1 P(Y) and L1 C/A, and between L1 P(Y) and L2C, respectively, based on measurements made by the SV contractor during SV manufacture. The values of T_{GD} and ISCs for each SV may be subsequently updated to reflect the actual on-orbit group delay differential. For maximum accuracy, the single frequency L1 C/A user must use the correction terms to make further modifications to the code phase offset in paragraph 20.3.3.3.3.~~1~~2 with the equation:

$$(\Delta t_{SV})_{L1C/A} = \Delta t_{SV} - T_{GD} + ISC_{L1C/A}$$

where T_{GD} (see paragraph 20.3.3.3.3.2) and $ISC_{L1C/A}$ are provided to the user as Message Type 30 data, described in paragraph 30.3.3.3.1.1. For the single frequency L2C user, the code phase offset modification is given by:

$(\Delta t_{SV})_{L2C} = \Delta t_{SV} - T_{GD} + ISC_{L2C}$

where, ISC_{L2C} is provided to the user as Message Type 30 data.

The values of $ISC_{L1C/A}$ and ISC_{L2C} are measured values that represent the mean SV group delay differential between the L1 P(Y)-code and the L1 C/A- or L2C-codes respectively as follows,

$$ISC_{L1C/A} = t_{L1P(Y)} - t_{L1C/A}$$

$$ISC_{L2C} = t_{L1P(Y)} - t_{L2C}$$

where, t_{Lix} is the GPS time the i^{th} frequency x signal (a specific epoch of the signal) is transmitted from the SV antenna phase center.

IS :

The correction terms, T_{GD}, $ISC_{L1C/A}$ and ISC_{L2C}, are initially provided by the CS to account for the effect of inter-signal biases between L1 P(Y) and L2 P(Y), L1 P(Y) and L1 C/A, and between L1 P(Y) and L2C, respectively, based on measurements made by the SV contractor during SV manufacture. The values of T_{GD} and ISCs for each SV may be subsequently updated to reflect the actual on-orbit group delay differential. For maximum accuracy, the single frequency L1 C/A user must use the correction terms to make further modifications to the code phase offset in paragraph 20.3.3.3.3.2 with the equation:

$(\Delta t_{SV})_{L1C/A} = \Delta t_{SV} - T_{GD} + ISC_{L1C/A}$

where T_{GD} (see paragraph 20.3.3.3.3.2) and $ISC_{L1C/A}$ are provided to the user as Message Type 30 data, described in paragraph 30.3.3.3.1.1. For the single frequency L2C user, the code phase offset modification is given by:

$(\Delta t_{SV})_{L2C} = \Delta t_{SV} - T_{GD} + ISC_{L2C}$

where, ISC_{L2C} is provided to the user as Message Type 30 data.

The values of $ISC_{L1C/A}$ and ISC_{L2C} are measured values that represent the mean SV group delay differential between the L1 P(Y)-code and the L1 C/A- or L2C-codes respectively as follows,

$$ISC_{L1C/A} = t_{L1P(Y)} - t_{L1C/A}$$

$$ISC_{L2C} = t_{L1P(Y)} - t_{L2C}$$

where, t_{Lix} is the GPS time the i^{th} frequency x signal (a specific epoch of the signal) is transmitted from the SV antenna phase center.

IS200-586 :

Section Number :
30.3.3.3.1.1.2.0-1

WAS :
The two frequency (L1 C/A and L2C) user shall correct for the group delay and ionospheric effects by applying the relationship:

$$PR = \frac{(PR_{L2C} - \gamma_{12} PR_{L1C/A}) + c\,(ISC_{L2C} - \gamma_{12} ISC_{L1C/A})}{1 - \gamma_{12}} - c\,T_{GD}$$

where,

PR = pseudorange corrected for ionospheric effects,

PR_i = pseudorange measured on the channel indicated by the subscript,

ISC_i = inter-signal correction for the channel indicated by the subscript (see paragraph 30.3.3.3.1.1),

T_{GD} = see paragraph 20.3.3.3.3.2,

c = speed of light,
and where, denoting the nominal center frequencies of L1 and L2 as f_{L1} and f_{L2} respectively,

$\gamma_{12} = (f_{L1}/f_{L2})^2 = (1575.42/1227.6)^2 = (77/60)^2$.

Redlines :

The ~~two~~ dual-frequency (L1 C/A and L2C) user shall correct for the group delay and ionospheric effects by applying the relationship:

$$PR = \frac{(PR_{L2C} - \gamma_{12} PR_{L1C/A}) + c\,(ISC_{L2C} - \gamma_{12} ISC_{L1C/A})}{1 - \gamma_{12}} - c\,T_{GD}$$

where,

PR = pseudorange corrected for ionospheric effects,

PR_i = pseudorange measured on the channel indicated by the subscript,

ISC_i = inter-signal correction for the channel indicated by the subscript (see paragraph 30.3.3.3.1.1),

T_{GD} = see paragraph 20.3.3.3.3.2,

c = speed of light,

and where, denoting the nominal center frequencies of L1 and L2 as f_{L1} and f_{L2} respectively,

$\gamma_{12} = (f_{L1}/f_{L2})^2 = (1575.42/1227.6)^2 = (77/60)^2$.

IS :

The dual-frequency (L1 C/A and L2C) user shall correct for the group delay and ionospheric effects by applying the relationship:

$$PR = \frac{(PR_{L2C} - \gamma_{12} PR_{L1C/A}) + c\,(ISC_{L2C} - \gamma_{12} ISC_{L1C/A})}{1 - \gamma_{12}} - c\,T_{GD}$$

where,

PR = pseudorange corrected for ionospheric effects,

PR_i = pseudorange measured on the channel indicated by the subscript,

ISC_i = inter-signal correction for the channel indicated by the subscript (see paragraph 30.3.3.3.1.1),

T_{GD} = see paragraph 20.3.3.3.3.2,

c = speed of light,

and where, denoting the nominal center frequencies of L1 and L2 as f_{L1} and f_{L2} respectively,

$$\gamma_{12} = (f_{L1}/f_{L2})^2 = (1575.42/1227.6)^2 = (77/60)^2.$$

IS200-588 :

Section Number :

30.3.3.3.1.2.0-1

WAS :

The ionospheric parameters which allow the “L1 only” or “L2 only” user to utilize the ionospheric model for computation of the ionospheric delay are contained in Message Type 30. The “one frequency” user should use the model given in paragraph 20.3.3.5.2.5 to make this correction for the ionospheric effects. The bit lengths, scale factors, ranges, and units of these parameters are given in Table 20-X.

Redlines :

The ionospheric parameters which allow the “L1 only” or “L2 only” user to utilize the ionospheric model for computation of the ionospheric delay are contained in Message Type 30. The “~~one~~ single-frequency” user should use the model given in paragraph 20.3.3.5.2.5 to make this correction for the ionospheric effects. The bit lengths, scale factors, ranges, and units of these parameters are given in Table 20-X.

IS :

The ionospheric parameters which allow the “L1 only” or “L2 only” user to utilize the ionospheric model for computation of the ionospheric delay are contained in Message Type 30. The “single-frequency” user should use the model given in paragraph 20.3.3.5.2.5 to make this correction for the ionospheric effects. The bit lengths, scale factors, ranges, and units of these parameters are given in Table 20-X.

IS200-598 :

Section Number :
30.3.3.4.4.0-1

WAS :
The three, one-bit, health indication in bits 155, 156, and 157 of Message Type 37 and bits 29,30 and 31 of each packet of reduced almanac refers to the L1, L2, and L5 signals of the SV whose PRN number is specified in the message or in the packet. For each health indicator, a “0” signifies that all signals on the associated frequency are okay and “1” signifies that some or all signals on the associated frequency are bad. The predicted health data will be updated at the time of upload when a new reduced almanac has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.

Redlines :
The three, one-bit, health indication in bits 155, 156, and 157 of Message Type 37 and bits 29, 30 and 31 of each packet of reduced almanac refers to the L1, L2, and L5 signals of the SV whose PRN number is specified in the message or in the packet. For each health indicator, a “0” signifies that all signals on the associated frequency are okay and “1” signifies that some or all signals on the associated frequency are bad. The predicted health data will be updated at the time of upload when a new midi almanac or reduced almanac has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.

IS :
The three, one-bit, health indication in bits 155, 156, and 157 of Message Type 37 and bits 29, 30 and 31 of each packet of reduced almanac refers to the L1, L2, and L5 signals of the SV whose PRN number is specified in the message or in the packet. For each health indicator, a “0” signifies that all signals on the associated frequency are okay and “1” signifies that some or all signals on the associated frequency are bad. The predicted health data will be updated at the time of upload when a new midi almanac or reduced almanac has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.

IS200-635 :

Section Number :
30.3.3.7.1.0-1

WAS :
Message Type 34 provides SV clock correction parameters (ref. Section 30.3.3.2) and also, shall contain DC parameters that apply to the clock and ephemeris data transmitted by another SV. One Message Type 34, Figure 30-7, shall contain 34 bits of clock differential correction (CDC) parameters and 92 bits of ephemeris differential correction (EDC) parameters for one SV other than the transmitting SV. Bit 150 of Message Type 34 shall be a DC Data Type indicator that indicates the data type for which the DC parameters apply. Zero (0) signifies that the corrections apply to CNAV data, $D_c(t)$, and one (1) signifies that the corrections apply to NAV data, D(t).

Redlines :
Message Type 34 provides SV clock correction parameters (ref. Section 30.3.3.2) and also, shall contain DC parameters that apply to the clock and ephemeris data transmitted by another SV. One Message Type 34, Figure 30-7, shall contain 34 bits of clock differential correction (CDC) parameters and 92 bits of ephemeris differential correction (EDC) parameters for one SV other than the transmitting SV. Bit 150 of Message Type 34 shall be a DC Data Type indicator that indicates the data type for which the DC parameters apply. Zero (0) signifies that the corrections apply to CNAV data, $D_c(t)$, and one (1) signifies that the corrections apply to ~~NAV~~LNAV data, D(t).

IS :
Message Type 34 provides SV clock correction parameters (ref. Section 30.3.3.2) and also, shall contain DC parameters that apply to the clock and ephemeris data transmitted by another SV. One Message Type 34, Figure 30-7, shall contain 34 bits of clock differential correction (CDC) parameters and 92 bits of ephemeris differential correction (EDC) parameters for one SV other than the transmitting SV. Bit 150 of Message Type 34 shall be a DC Data Type indicator that indicates the data type for which the DC parameters apply. Zero (0) signifies that the corrections apply to CNAV data, $D_c(t)$, and one (1) signifies that the corrections apply to LNAV data, D(t).

IS200-672 :

Section Number :
30.3.4.2.0-1

WAS :
In controlling the SVs and uploading of data, the CS shall allow for the following timing relationships:

a. Each SV operates on its own SV time;

b. All time-related data (TOW) in the messages shall be in SV-time;

c. All other data in the Nav message shall be relative to GPS time;

d. The acts of transmitting the Nav messages shall be executed by the SV on SV time.

Redlines :
In controlling the SVs and uploading of data, the CS shall allow for the following timing relationships:

a. Each SV operates on its own SV time;

b. All time-related data (TOW) in the messages shall be in SV-time;

c. All other data in the ~~Nav~~CNAV message shall be relative to GPS time;

d. The acts of transmitting the ~~Nav~~CNAV messages shall be executed by the SV on SV time.

IS :
In controlling the SVs and uploading of data, the CS shall allow for the following timing relationships:

a. Each SV operates on its own SV time;

b. All time-related data (TOW) in the messages shall be in SV-time;

c. All other data in the CNAV message shall be relative to GPS time;

d. The acts of transmitting the CNAV messages shall be executed by the SV on SV time.

IS200-1399 :

Section Number :
30.3.4.4.0-1

WAS :
The t_{oe} shall be equal to the t_{oc} of the same CNAV CEI data set. t_{op} does not have to match t_{oe}/t_{oc}. As a redundant check, t_{op} in Message Type 10 and 11 will match with the t_{op} term in Message Type 30-37 for a valid CEI data set. The following rule governs the transmission of t_{oe} and t_{oc} values in different data sets: The transmitted t_{oe}/t_{oc} will be different from any value transmitted by the SV during the preceding six hours. Cutovers to new CEI data sets will occur only on hour boundaries except for the first data set of a new CEI data sequence propagation. The first CEI data set may be cut-in (reference paragraph 30.3.4.1) 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 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 invalid 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.

Normal Operations. The Message Type 10, 11, and 30-37 CEI data sets are transmitted by the SV for periods of two hours. The corresponding curve fit interval is three hours.

Redlines :
The t_{oe} shall be equal to the t_{oc} of the same CNAV CEI data set. t_{op} does not have to match t_{oe}/t_{oc}. As a redundant check, t_{op} in Message Type 10 and 11 will match with the t_{op} term in Message Type 30-37 for a valid CEI data set. The following rule governs the transmission of t_{oe} and t_{oc} values in different data sets: The transmitted t_{oe}/t_{oc} will be different from any value transmitted by the SV during the preceding six hours. Cutovers to new CEI data sets will occur only on hour boundaries except for the first data set of a new CEI data sequence propagation. The first CEI data set may be cut-in (reference paragraph 30.3.4.1) 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 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 ~~invalid~~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.

Normal Operations. The Message Type 10, 11, and 30-37 CEI data sets are transmitted by the SV for periods of two hours. The corresponding curve fit interval is three hours.

IS :
The t_{oe} shall be equal to the t_{oc} of the same CNAV CEI data set. t_{op} does not have to match t_{oe}/t_{oc}. As a redundant check, t_{op} in Message Type 10 and 11 will match with the t_{op} term in Message Type 30-37 for a valid CEI data set. The following rule governs the transmission of t_{oe} and t_{oc} values in different data sets: The transmitted t_{oe}/t_{oc} will be different from any value transmitted by the SV during the preceding six hours. Cutovers to new CEI data sets will occur only on hour boundaries except for the first data set of a new CEI data sequence propagation. The first CEI data set may be cut-in (reference paragraph 30.3.4.1) 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 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.

Normal Operations. The Message Type 10, 11, and 30-37 CEI data sets are transmitted by the SV for periods of two hours. The corresponding curve fit interval is three hours.

IS200-1377 :

Section Number :
40.3.3.5.1.3.0-1

WAS :
Subframes 4 and 5 contain two types of SV health data: (a) each of the 31 pages which contain the clock/ephemeris related almanac data provide an eight-bit SV health status word regarding the SV whose almanac data they carry, and (b) the 25th page of subframe 4 and of subframe 5 jointly contain six-bit health status data for up to 31 SVs.

The three MSBs of the eight-bit health words indicate health of the LNAV data in accordance with the code given in Table 20-VII. The six-bit words provide a one-bit summary of the LNAV data's health status in the MSB position in accordance with paragraph 40.3.3.3.1.4. The five LSBs of both the eight-bit and the six-bit words provide the health status of the SV's signal components in accordance with the code given in Table 20-VIII. A special meaning is assigned, however, to the "6 ones" combination of the six-bit health words in the 25th page of subframes 4 and 5: it indicates that "the SV which has that ID is not available and there may be no data regarding that SV in that page of subframes 4 and 5 that is assigned to normally contain the almanac data of that SV" (NOTE: this special meaning applies to the 25th page of subframes 4 and 5 only). The health indication shall be given relative to the "as designed" capabilities of each SV (as designated by the configuration code -- see paragraph 40.3.3.5.1.4). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or it has been configured into a mode which is normal from a user standpoint and does not require that capability.

Additional SV health data are given in subframe 1. The data given in subframes 1, 4, and 5 of the other SVs may differ from that shown in subframes 4 and/or 5 since the latter may be updated at a different time.

The eight-bit health status words shall occupy bits 17 through 24 of word five in those 31 pages which contain almanac data for individual SVs. The six-bit health status words shall occupy the 24 MSBs of words four through nine in page 25 of subframe 5 plus bits 19 through 24 of word 8, the 24 MSBs of word 9, and the 12 MSBs of word 10 in page 25 of subframe 4.

The predicted health data will be updated at the time of upload when a new almanac has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.

Redlines :
Subframes 4 and 5 contain two types of SV health data: (a) each of the 31 pages which contain the clock/ephemeris related almanac data provide an eight-bit SV health status word regarding the SV whose almanac data they carry, and (b) the 25th page of subframe 4 and of subframe 5 jointly contain six-bit health status data for up to 31 SVs.

The three MSBs of the eight-bit health words indicate health of the LNAV data in accordance with the code given in Table 20-VII. The six-bit words provide a one-bit summary of the LNAV data's health status in the MSB position in accordance with paragraph ~~40~~20.3.3.3.1.4. The five LSBs of both the eight-bit and the six-bit words provide the health status of the SV's signal components in accordance with the code given in Table 20-VIII. A special meaning is assigned, however, to the "6 ones" combination of the six-bit health words in the 25th page of subframes 4 and 5: it indicates that "the SV which has that ID is not available and there may be no data regarding that SV in that page of subframes 4 and 5 that is assigned to normally contain the almanac data of that SV" (NOTE: this special meaning applies to the 25th page of subframes 4 and 5 only). The health indication shall be given relative to the "as designed" capabilities of each SV (as designated by the configuration code -- see paragraph 40.3.3.5.1.4). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or it has been configured into a mode which is normal from a user standpoint and does not require that capability.

Additional SV health data are given in subframe 1. The data given in subframes 1, 4, and 5 of the other SVs may differ from that shown in subframes 4 and/or 5 since the latter may be updated at a different time.

The eight-bit health status words shall occupy bits 17 through 24 of word five in those 31 pages which contain almanac data for individual SVs. The six-bit health status words shall occupy the 24 MSBs of words four through nine in page 25 of subframe 5 plus bits 19 through 24 of word 8, the 24 MSBs of word 9, and the 12 MSBs of word 10 in page 25 of subframe 4.

The predicted health data will be updated at the time of upload when a new almanac has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.

IS :
Subframes 4 and 5 contain two types of SV health data: (a) each of the 31 pages which contain the clock/ephemeris related almanac data provide an eight-bit SV health status word regarding the SV whose almanac data they carry, and (b) the 25th page of subframe 4 and of subframe 5 jointly contain six-bit health status data for up to 31 SVs.

The three MSBs of the eight-bit health words indicate health of the LNAV data in accordance with the code given in Table 20-VII. The six-bit words provide a one-bit summary of the LNAV data's health status in the MSB position in accordance with paragraph 20.3.3.3.1.4. The five LSBs of both the eight-bit and the six-bit words provide the health status of the SV's signal components in accordance with the code given in Table 20-VIII. A special meaning is assigned, however, to the "6 ones" combination of the six-bit health words in the 25th page of subframes 4 and 5: it indicates that "the SV which has that ID is not available and there may be no data regarding that SV in that page of subframes 4 and 5 that is assigned to normally contain the almanac data of that SV" (NOTE: this special meaning applies to the 25th page of subframes 4 and 5 only). The health indication shall be given relative to the "as designed" capabilities of each SV (as designated by the configuration code -- see paragraph 40.3.3.5.1.4). Accordingly, any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or it has been configured into a mode which is normal from a user standpoint and does not require that capability.

Additional SV health data are given in subframe 1. The data given in subframes 1, 4, and 5 of the other SVs may differ from that shown in subframes 4 and/or 5 since the latter may be updated at a different time.

The eight-bit health status words shall occupy bits 17 through 24 of word five in those 31 pages which contain almanac data for individual SVs. The six-bit health status words shall occupy the 24 MSBs of words four through nine in page 25 of subframe 5 plus bits 19 through 24 of word 8, the 24 MSBs of word 9, and the 12 MSBs of word 10 in page 25 of subframe 4.

The predicted health data will be updated at the time of upload when a new almanac has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.